





Miss. Th. 2243

8

1883

THE HISTORY OF THE

UNITED STATES OF AMERICA

FROM 1776 TO 1876

BY

W. D. HOWARD

Author of "The History of the United States of America from 1776 to 1876"

ILLUSTRATED WITH PLATES

BY

JOHN J. HARRIS

Author of "The History of the United States of America from 1776 to 1876"

NEW YORK

JOHN J. HARRIS

Author of "The History of the United States of America from 1776 to 1876"

NEW YORK

1883

C A N
E S S A Y
U P O N
T U N E.

BEING AN ATTEMPT

To free the SCALE of Music, and the TUNE
of INSTRUMENTS, from Imperfection.

by
Mr Maxwell
of Broomholme in Scotland.
ILLUSTRATED WITH PLATES.

[Francis Kelly Maxwell]

Il n'y a point des Erreurs dans la Nature.

EDINBURGH:

Printed for C. ELLIOT, EDINBURGH;
and T. CADELL, LONDON.

MDCCLXXXI. 1781

A/63/ 552

Bayerische
Staatsbibliothek
MÜNCHEN

C O N T E N T S.

P A R T I.

Of the TUNE of the FIDDLE.

	Page
CHAP. I. <i>An introductory account of the scale of music,</i> - - -	I
CHAP. II. <i>Of the relation of the minor to the major mode ; and of the nature of tuneful intervals,</i> - - -	22
CHAP. III. <i>A general examination of the fiddle, and experiments upon the manner of stopping it,</i> - - -	28
CHAP. IV. <i>Explanations preparatory to a particular examination of the regulated scales for the tune of the fiddle, and of the regulation of tune in general,</i>	38
CHAP. V. <i>Of pitching the key-note C natural upon the fiddle, and hence regulating the tune of all the keys with sharps,</i>	55
CHAP. VI. <i>Of pitching the key-note F' for the key major with one flat, and hence deriving the regulation of all the keys with flats,</i> - - -	98
CHAP. VII. <i>Of the advantages arising from the regulated scales ; and of the capacity of the ear,</i> - - -	131

P A R T II.

Of the TUNE of the ORGAN.

	Page
CHAP. I. <i>Explanation of the Scales N^o 32.</i>	
<i>to N^o 43.</i> - -	153
CHAP. II. <i>Explanation of the scale for</i>	
<i>tuning the organ, and the number of</i>	
<i>degrees of tune required in each octave,</i>	172
CHAP. III. <i>Of the Table collecting and</i>	
<i>estimating the several degrees of tune; and</i>	
<i>a further view of the elements of music,</i>	183
CHAP. IV. <i>General plan of an organ capa-</i>	
<i>ble of true diatonick tune in all its keys,</i>	201
CHAP. V. <i>Of the internal intervals of</i>	
<i>the diatonick scale; and of the false in-</i>	
<i>tervals corrected,</i> - -	205
CHAP. VI. <i>Objections to the constitution</i>	
<i>of the scale removed, the diverging</i>	
<i>nature of tune explained, and the man-</i>	
<i>ner of preserving or restoring the ori-</i>	
<i>ginal pitch,</i> - -	216
CHAP. VII. <i>Of a new opinion concern-</i>	
<i>ing the connection between musical ra-</i>	
<i>tios and a circle,</i> - -	243
CONCLUSION, - -	250
APPENDIX, - -	253



A N
E S S A Y
U P O N
T U N E.

P A R T I.
Of the TUNE of the FIDDLE.

C H A P. I.

An introductory account of the scale of music.

TO pave the way for such readers as are unacquainted with the scale of music, and to assist them to understand what follows, it seems necessary to premise, That the judgment of the ear, and the sentiment of pleasure or of offence from musical sound, depend upon a comparison

parifon of the feveral degrees of it with one particular tone, either actually exprefsed, or tacitly underftood to accompany them; which tone is called the *key-note*: and the degree of this judgment, and of this fentiment, is the talent which is meant to be exprefsed, when it is faid one is poffeffed of a good or of a bad ear.

This key-note is not any particular fixed degree of acutenefs or gravity: for any degree of tune that fuits the compafs of the voice or instrument, may be affumed as a key-note; the idea of which being impreffed upon the mind, the reft are all referred to it.

One cannot illuftrate this better, than by calling to mind that *tool* the bag-pipe, where the great drone gives a continuation of the key-note through the whole. However difguffing this may be, from the dullnefs of its monotony; yet, in the beft performances, if the idea of the key-note be loft, the connection of the tune is alfo loft, although it is not often attended to, or diftinctly perceived at all times.

Theory

Theory teaches, that to this key-note there belongs a system of seven different degrees of tune, which, under the regulation of certain laws, can succeed to each other agreeably; and this is called *melody*: Or they may be joined in consonance, not all at the same time, but in certain groups and successions; and this is called *harmony*.

Perhaps nature can afford more; but these are all that have been expressly discovered and defined hitherto by musicians, or that are acknowledged in composition and practice.

For although we can stretch greatly beyond this simple system, either ascending or descending; yet musicians know, that this is only a repetition of the same order of degrees: because the eighth note above the key-note, called its *octave*, although it be much acuter than the key-note, yet gives the same musical idea with the key-note itself; and so does the eighth note, above or below any note of the system, pro-

duce the same idea as do the notes themselves respectively.

This may be exemplified, by supposing a song to be sung in the same part by a man and woman. In this case, the woman's voice will be, in every note, a just octave higher than the man's voice, and yet they shall agree in expressing the same tune. And it is known, that when a song is carried higher or lower than the performing voice or instrument can reach, the performer may supply that defect, by striking the tune of the notes he cannot reach, differently by octave. The tune will thus be preserved the same, although the effect cannot be altogether so agreeable: owing, however, only to the jump, which breaks the smoothness of the progress of the music; but not at all to any alteration in the fundamental relation of the terms, or of the idea expressed by the music.

We must still go a little further, and advertise the inquirer, that although it be true, as has been said, that no more than
seven

seven degrees of tune do properly belong to any given key-note, yet there are two different scales, or rather two different orders, of these musical degrees. To explain this, it must also be told, that the musical degrees of ascent, or of descent, from a given key-note, are by no means equal. They are of three different dimensions, called *tone greater*, *tone lesser*, and *semi-tone*. What these dimensions are shall be afterwards shown.

These scales arise from the key-note, in the following order ascending.

MAJOR MODE.

Key	2d,	3d,	4th,	5th,	6th,	7th,	Octave
Tone greater	Tone lesser	Semi-tone.	Tone greater	Tone lesser	Tone greater	Semi-tone	

MINOR MODE.

Key	2d,	3d,	4th,	5th,	6th,	7th,	Octave
Tone greater	Semi-tone	Tone lesser	Tone greater	Semi-tone	Tone greater	Tone lesser	

Both these scales afford agreeable music: and the reason why the one is called

the *major*, and the other the *minor* mode, is, because the third step of the former rises from the key-note by two degrees, called *tone greater* and *tone lesser*; which makes that third note acuter than the third note of the other mode, which rises only by the *tone greater* and *semi-tone*.

The sixth and seventh of the major mode are likewise acuter than those natural to the minor, as will afterwards be better understood; although frequently the minor also admits of the sharp sixth and seventh, as composers know. But as this essay is confined to the consideration of the tune of instruments, the reason needs not be here explained.

It is a matter of perfect indifference, what note of the scale of music commonly used is assumed as a key-note, provided from thence the other notes of that key be taken, by just intervals, as they stand in one or other of the orders of degrees mentioned, according as the music is designed to be of the 'greater or of the lesser mode. And all musicians, by general

ral

ral consent, have agreed to assume the note distinguished by the letter C, as the natural key-note of the greater mode; which being fixed, A is thereby determined to become the natural key-note of the lesser mode, for reasons which will afterwards appear.

In order to obtain variety, so essential to the purposes of musical entertainment, it has been found necessary to contrive instruments so, that other notes may occasionally be introduced as key-notes, as well as C or A.

The two modes of tune already described, being found by experience to have the only true relations among their degrees, that are agreeable to the ear; the new key-notes to be introduced ought to be provided also with sets of notes, bearing truly tuneful relation to each of them. But difficulties, hitherto deemed insuperable, have obstructed the success of all attempts to gain this end.

The inequality of the intervals between the notes of the natural scales of music,

renders several of the notes prepared to suit one key unfit to be applied to another: and some of the differences being very small, and hitherto it appearing impossible to adjust them, have been overlooked; while those that are larger have been grossly corrected by the insertion of new degrees of tune, which cannot be perfectly adjusted to one key without becoming offensive to another. Hence musicians have been forced to lay aside the true quantities of the intervals of natural tune, overlooking the difference between the tone greater and the tone lesser, and to adopt what they indiscriminately call a *full tone*, in place of either the one or the other of these; while the *semi-tone*, so called, is considered by them as the just half of this gross interval called a *full tone*, although the true elementary semi-tone is known to be greater than the half of the tone greater.

This is one capital source of error in all our instrumental performances; and the fault becomes plainly perceptible to an
ordinary

ordinary ear, if it has once, upon accurate trial, experienced the superior effects of tune truly adjusted.

The only palliation that has been applied, is an attempt to diminish these errors, by spreading them equally over the whole system, so that the ear may be less shocked. And were it certain that this could be perfectly accomplished, the consequence would be, that although the ear would never be shocked by gross discord, yet it never would hear good concord. For, whatever capital performers upon the violin, and such kind of instruments which are called perfect, may pretend, it seems not at all doubtful, that their best performances are far from being just, and that means will be found for convicting them of considerable and frequent error.

Besides the accuracy of the pitch, the idea of perfect tune likewise implies in it that of pure sound, free from all inequalities in the vibratory motions. But as this is not to be hoped for from instruments

ments composed of such imperfect materials as we have, all that is here meant by *perfect tune*, is the nearest approach to it that can be made upon such an instrument as the fiddle; the constitution of which affords scope for attaining to it, as near as the imperfections of our sounds will allow: and in this last sense only it must be understood to be used in this essay.

Before proceeding directly to the subject, it must be further observed, that the object proposed being only the examination and reformation of the tune of instruments, the theory of music is not meant to be introduced, further than in stating facts: and this liberty shall be used sparingly, keeping close to what seems strictly necessary for the present purpose; the object aimed at being the improvement of the art, not rank among the learned.

The reader is supposed to have acquired an ordinary degree of acquaintance with the manner of writing music, and
with

with performance upon some instrument. Very little of the last is requisite; only he ought either to be able to draw a fine tone from the fiddle, or procure some person who can do it, for the purpose of examining the experiments proposed to be made upon that instrument.

The utmost care must be taken, that the strings be just, and that the tune of them be made perfectly chord of fifth to each other: a very small defect in either of these conditions will ruin the experiment. We must even descend to advise, that the fiddle which is to be used for trying these experiments, be kept perfectly free from all damp.

It has been already said, that there are two modes of music, distinguished from each other by the different order of the degrees of tune from the key-note: one of them requiring the third, sixth, and seventh, greater; and the other, the third, sixth, and seventh, lesser. If the same pitch of tune be taken as the key-note to both, the second, the fourth, the fifth, and

and the octave, will be unison; the third, sixth, and seventh degrees of the key-major, will be acuter by what is called half a note, than those of the minor.

Although it has been said, that the note C being assumed for the key-note of the major mode, A necessarily becomes the key-note of the minor; that is, when both are natural, and without signs sharp or flat upon the cleff; yet those who are acquainted with the manner of writing music, know, that, by the help of these signs, musicians can regulate any key, from any note or half note. To make the comparative view of the two modes more plain, the two scales, representing the degrees of each mode, are made to proceed from the same note C, the natural key-note of the major mode; fitting it, by flat signs, also to become the key-note of the minor. See the Scales, N^o 1. and 2. And if a piece of music were composed and performed, so as to proceed through its changes of keys by the intervals marked in these scales perfectly adjusted, the performance

performance would be in true diatonic tune; at least, for the present it may be so supposed.

By various experiments, it has been discovered, that the relation of one sound to another may be measured by the number of the vibrations of the strings producing sound, accomplished in the same, or in equal times. Methods have also been found to estimate these relative numbers, and apply them to the calculation of musical sound.

Musical sounds are clear, even, and smooth tones, continuing for some space of time without alteration in the degree of acuteness or gravity; in opposition to confused noise, or continuous tune: which last rises or falls, not by steps or degrees, but in continuity; as does the tune of a fiddle-string, when the finger is slid along it.

The ratios of the degrees of tune have been determined to be as follows: The ratio of tone greater, as 8 is to 9; of tone lesser, as 9 is to 10; and of semi-tone,
as

as 15 is to 16.: the number of the vibrations of the string producing the graver tone, being expressed by the lesser number; and the number of the vibrations of the string producing the acuter tone, being expressed by the greater number.

But observe, that this interval, 15 : 16, called *semi-tone*, is not the just half of either of these tones; for the sum of two such semi-tones added together, is greater than the tone greater. It is only called semi-tone, because, being one of the true degrees of the diatonick scale, it does not much exceed half a tone greater; and musicians, hitherto, neglecting this nicety of difference, have given it that name indiscriminately with its complement to the tone greater, or tone lesser. We shall, however, continue to give it the name of *semi-tone*, adding the word *elementary* when there is hazard of doubt, and distinguishing its complement to the tone greater by the name of *limma major*. And these three degrees, tone greater $\frac{8}{9}$,
tone

tone leffer $\frac{2}{10}$, and the elementary semi-tone $\frac{1}{10}$, shall be called in general *elements*; because all tuneful ratios or intervals, and their differences, hitherto acknowledged, are constituted by the composition and resolution of these.

From the Scales, N° 1. and 2. it appears, that, in the greater mode, one of the elementary semi-tones takes its place between the third and the fourth degrees of the scale, and the other between the seventh and the eighth; but, in the lesser mode, these semi-tones fall, one between the second and third, and the other between the fifth and sixth degrees, all the other degrees being full tones.

But musicians have found, as was formerly noticed, that to obtain the variety required for musical entertainment, they must be furnished with the means of changing the note first assumed as the key-note, and of introducing another note as a new key-note at pleasure; consequently, the situation of the semi-tones (which must always take the place already assigned

assigned them in relation to whatever new key-note is introduced) must likewise be altered. For accomplishing this end, the only means which has hitherto been fallen upon is, to suppose all the degrees called *tones* to be of equal dimensions, and the *semi-tones* likewise to be equal and just halves of the tones; neither of which suppositions are founded on truth. It is upon this false hypothesis that all our instruments with fixed notes are formed; such as organs, harpsichords, &c. In forming these, a note is inserted between the extremes of each of the full tones, tuned as nearly as possible equidistant from both; and the places of the elementary semi-tones being left without the insertion of any factitious semi-tone, the whole octave thus becomes divided into thirteen notes, each half a tone distant from the note next to it. This division of the octave is represented to the eye in the disposition of the finger-keys of the harpsichord or organ; the short finger-keys representing the factitious notes, and the long ones the
natural

natural notes. Flutes, hautboys, and other instruments of that kind, are still in a worse predicament. The gammuts contrived for them afford but an awkward supply of the artificial semi-tones, and thereby one error is added to another. Even the fiddle is not exempted from this general falsity of tune; for its natural tune shall be shewn to be false in all the keys but one.

Besides the difficulties arising from the inequalities among the intervals, which have obstructed the formation of instruments capable of true tune, there is another which has driven musicians to despair of obtaining even a division of the scale into equal hemitonic parts. This is, the impossibility of dividing the tone greater and tone lesser into equal parts, or of finding any interval which may accurately represent the half of the sum of the tone greater and tone lesser added together, so as to make a set of equal factitious full tones.

Theory teaches, that the relation of the
B degrees

degrees of tune depends upon the relative numbers of vibrations producing sound, performed in equal times. It is therefore from the relations of numbers that the relations of tuneful sounds must be discovered.

To divide an interval of tune into two equal parts, must be to place a middle tone between the extremes of that interval, the number of whose vibrations, in a given time, shall bear the same geometric ratio to those of the lower extreme of the interval to be divided, as the number of the vibrations of its higher extreme, performed in the same time, does to those of the middle tone.

For example: Let 2 and 8 represent the number of vibrations performed in the same or equal times, by two sounding bodies. If it be required to put a note between them, which shall be a true mean to these extremes, their geometric mean must be found. This is done by multiplying them together, and extracting the square root of the product. Thus,
2 and

2 and 8 multiplied give 16, the square root of which is 4. If 4, therefore, be placed between the two given numbers, it shall be a true mean, dividing the interval into parts perfectly equal. Thus the ratio $2 : 8$ is known to represent a double octave; and $2 : 4$, or $4 : 8$, whose ratios are equal, both represent a single octave; and the equal division of the given ratio of tune $2 : 8$ is accurately represented by these numbers $2 : 4 : 8$.

But the extremes of the tone greater being $8 : 9$, if these are multiplied together, the square root is surd, and cannot be found in rational numbers; therefore no middle term can be inserted between them, which, in rational numbers, can bear the same proportion to the lesser as the greater does to it. The extremes of the tone lesser are in the same predicament; and it is also impossible to divide the sum of the tone greater added to the tone lesser, so as to find a mean full tone. Thus, a true geometric mean, being every way impossible to be

found in rational numbers, which only are applicable to calculations of tune, the equal division of the scale into half-notes is also impossible; and the falsity of the tune of instruments must be increased, even beyond what at first seems to flow from the false hypothesis upon which they are constructed.

And further, were it even possible that the tone greater and tone lesser could be equally divided, or that a full tone, equal to the half of the sum of these two added, could be found, and equally divided, the sum of any number of such half-notes, or the sum of any number of elementary semi-tones, would either exceed or fall short of the true interval of octave. Thus, besides the falsity of such a division in respect of other intervals, it would also ruin the perfection of the octave, the only interval hitherto remaining entire, as a barrier against utter demolition.

Theory teaches, that the difference between the tone greater and the tone lesser is accurately represented by the ratio
80:81,

80: 81, called *comma*. The next expedient, therefore, that naturally occurs, is to attempt a division of the elements, down to such a number of commas as they may contain. But, besides the difficulty that would be found in performing upon an instrument accoutred with such a multitude of finger-keys, it is found that comma cannot divide any of the three diatonick elements, without leaving a remainder; and the matter, even in respect of bare possibility, is left hopeless in all these views.

Yet we despair not of being able to give rules, easy to be followed by a performer upon the violin, which will direct him towards perfect tune, and enable him to approach it as near as his industry and command of hand will permit; qualifying him also to judge of errors with the utmost precision.

We hope also to be able to give such plans of construction for other instruments, as will afford perfect tune in every key, free from all defect or excess, even

in the relations of the internal intervals of the scale of music; the correction of which has hitherto baffled the most anxious essays.

C H A P. II.

*Of the relation of the minor to the major mode ;
and of the nature of tuneful intervals.*

BY comparing the degrees of the two modes, (see scales, N° 1. and 2.) it will appear, that the sixth of the greater mode, which is A, being supposed to be key-note, and thence reckoning upwards, the tones and semi-tones succeed each other in the same order as they do from the key-note C, in the scale N° 2.; excepting only the interval between the third and the fourth, being E and F, which, in the scale N° 2. is tone lesser; but, in the scale N° 1. reckoning upwards from A, to the third and fourth above it, being C and D, the interval is
tone

tone greater; and also the interval between the fourth and the fifth of the scale N° 2. being F and G, which is tone greater; but, in the scale N° 1. reckoning upwards from A to its fourth D and fifth E, the interval between these two notes is tone lesser.

If D be flattened by comma, the interval between C and D will become tone lesser; and the interval between D and E, consequently, will thereby become tone greater: by which correction, the progress of the degrees from A, the sixth of the greater mode, will become perfectly the same with the true diatonick progress of the degrees of the lesser mode from the key-note.

But as the difference of the greater and lesser tone has hitherto been neglected by musicians, the sixth of the major mode has always been admitted as the key-note to the minor mode, without adding any mark of distinction to signify the true pitch of the fourth of the minor, and point out the difference between it

B 4

and

and the second of the major mode. This, however, must not now be neglected, seeing we aim at the discovery of perfect tune; to which that, or any omission whatever, would justly forfeit all title.

The diatonick degrees, or elements of music, which tunefully divide the scale, being those already mentioned, tone greater, tone lesser, and semi-tone; in the computation of all true musical intervals, no other degrees must be admitted, nor even fractions of these degrees: for it is believed, that every interval, which cannot be measured by these degrees as integers, is false. Whether or not this be strictly true, may afterwards appear; but, in the meanwhile, we follow the established opinion.

Every interval of tune must thus be commensurable by these elementary degrees as integers, when a note is compared with its key-note, or with any other note to which it stands related in the same system of melody or harmony. But it must not be understood, that no other methods of computation can be
used

used to find the differences of particular notes belonging to the same general system of twenty-four keys; many of which are hitherto supposed to have no connection with each other in direct harmonical or tuneful relation; and therefore such differences are liable to no such restriction in computing them. But this will not be perfectly understood till we arrive at the place where such methods of computation become necessary.

The tables, where each musical interval is computed by the number of elements it contains, will serve as a guide in our progress through the whole keys of music. See the scales N° 3. and N° 4. where the music-lines, or *staff* as it is called, contains the notes as they arise upwards from the respective key-notes. The quantity of each interval is marked in writing, between each of the notes and that next to it; its name, as *key-note*, or as *second*, or *third*, &c. of the key, is marked under the staff; and the sum of its distance from the key-note, in the different elementary

elementary degrees, is marked in columns below. But it must also be observed, that the terms, *third greater*, *third lesser*, *fourth*, *fifth*, &c. likewise mean, That any two notes, whose interval, in respect of each other, is the same as these are to the key-note, are said to stand as third, fourth, fifth, &c. to each other: but, to prevent ambiguity, the meaning shall be clearly marked, by saying, *second*, *third*, &c. of the key, when the relation of any note to the key-note is meant to be expressed; when its relation to any other note is meant, it shall be called *chord* of third, &c. to that note.

It must likewise be premised, that no other intervals are acknowledged as musical but those above referred to, comprehended in the two scales N° 3. and 4.: and every interval that is not equal to one or other of these, is deemed to be out of tune; for, as already noticed, after passing the bounds of the octave, the other notes are only a repetition of the former intervals either above or below. The
octave

octave and second, called *ninth*, is properly estimated in composition as a simple second: so also the octave and third, tho' *tenth*, is of no other value than a simple third; and so on, after passing double or triple octave above or below.

It is true, that a false fourth, called the *tritone*, and a false fifth, called the *semidiapente*, are also in use; but these need not be particularly noticed here.

These scales, N^o 3. and 4. are drawn for the purpose of examining the degrees of tune. Every interval which corresponds not precisely with one of those marked in the scales, both in the number and species of its component elements, must be held to be false; and all the intervals marked in the scales, except the second and seventh, are called *concorde*s. The second and seventh, with the false fourth and fifth, are called *concinuous discords*; because they are held to be disagreeable, when produced in consonance, without relation to others: yet they afford very agreeable effects, when properly prepared
and

and resolved in composition, either as melody or harmony.

C H A P. III.

A general examination of the tune of the fiddle, and experiments upon the manner of stopping it.

WE shall now proceed to examine the tune of the fiddle, and learn wherein it disagrees or coincides with the intervals of tune, in scales N° 3. and 4.

The four strings of a fiddle being tuned just chords of fifth, each to the others next it, after the common method; and the chord of fifth appearing from both these scales to be composed of two tones greater, one tone lesser, and one semi-tone, which, in computations of this kind, shall be distinguished by the letters G, L, S, signifying tone greater, tone lesser, and semi-tone.

The

The third string will be a- G. L. S.
cuter than the fourth string by 2 1 1

The second string will be acuter than the third by - 2 1 1

The sum of the interval of tune between the fourth and the second string is - - 4 2 2

Upon looking into the scales, N° 3. and 4. this interval, $\frac{G. L. S.}{4:2:2}$, will be found to stand in both as ninth to the key-note; and consequently the tune of the open fourth string being assumed as the key-note, the open third string, and also the open second string, are both in the true tune of that key. To these let us now add the tune of the open first string, being still acuter than the tune of the second string by the chord of fifth.

G. L. S.

The former sum was 4 2 2

The first string is acuter than the second by - - 2 1 1

The sum of these is - 6 3 3
The

This sum is nowhere to be found in these tables ; therefore the open first string E is not in tune to the open fourth string G, which last is in this case the key-note.

In computing the interval between the open fourth string and the open second string, it was found, that these two degrees of tune stand in the true relation of ninth to each other ; and it is known, that the interval of ninth is equal to the octave and tone greater. If, therefore, the third string be stopped, so as to give the true chord of octave to the open fourth string, the remaining interval between the tune of the third string so stopped, and the open second string, must be the tone greater. And, universally, when any three strings are tuned just chord of fifth to each other, if the middle one be stopped so as to give octave to the lowest, the interval between this stopped note and the open tune of the highest of the three must be the tone greater. Plate VIII. fig. 19.

But if, instead of stopping this note, G, upon the third string, octave to the
open

open fourth string, the second string should be stopped in unison to the first string; then taking the tune of G upon the third string, as chord of sixth greater below the unison of the open first string, it will be found, that G upon the third string, thus stopped, will not give the chord of octave to the open fourth string, being somewhat too acute. See Plate VIII. fig. 20.

In scale N^o 3. it will be found, that the chord of sixth greater is an interval composed of the chord of fifth and the tone lesser; therefore the interval now existing between G, stopped in this last way, and the open tune of the second string, must be the tone lesser. The ear will be found to distinguish so minutely in this and the following experiments, that one is tempted almost to assert, that the very *punctum* of perfect tune is discernible.

Comma being the difference between the tone greater and the tone lesser; the difference between G stopped octave to
the

the open fourth string, and the same note taken as chord of sixth greater below the tune of the first open string, must be comma. Thus we learn how to tune comma with great precision; and this distinction may be made upon every note of the fiddle, as will appear from the regulated scales afterwards to be mentioned: from which is drawn this general inference.

First general Inference.

When four strings, or chords, are tuned true chord of fifth to each other, as in the tune of the fiddle; if the lowest but one be stopped octave to the lowest, the interval between the tune of that stop, and the open tune of the highest but one, is tone greater. But if it be stopped chord of sixth greater to the open tune of the highest string; the interval between that stop, and the open tune of the highest but one, is tone lesser; and the difference of those two stops is comma.

Two

Two examples more shall be given of the manner of tuning comma, or, which is the same thing, of regulating the difference between the tone greater and the tone lesser, before examining the scales for the regulation of the tune of the fiddle.

The first finger, placed upon the second string, so as to give B natural, may be taken as chord of fourth to the open first string, or as chord of sixth greater to the open third string. If the finger be accurately adjusted, so as to give the perfect chord of fourth to the open first string, and, continuing it in the same position, the bow shall strike the open third string along with the second string thus stopped, they will be found to be out of tune. Move the finger a small space backwards, so as to flatten the stop a little; it will then give the perfect chord of sixth greater with the open third string: but, in this position, the chord of fourth with the open first string will be destroyed; and these two concords cannot be struck in

C

tune,

tune, from the same position of the finger.
See Plate VIII. fig. 21. 22.

The chord of fourth, containing one tone greater, one tone lesser, and one semi-tone; and that of the sixth greater, containing two tones greater, two tones lesser, and one semi-tone, (see the scale, N° 3.) may be added thus:

	G. L. S.		
Chord of fourth	-	1	1 1
Chord of sixth greater		2	2 1
Sum	- -	3	3 2

The interval of tune between the open third string and the open first string has been shewn to be a ninth, which contains four tones greater, two tones lesser, and two semi-tones. Thus each of these intervals contains six tones and two semi-tones. But the interval compounded of the chords of fourth and sixth is the least of the two; because, in balancing the sums, it is less than the other by the difference between the tone minor and the tone major, which is comma.
Therefore

Therefore the interval between the pitch of tune which gives the chord of fourth with the first string, and that which gives the chord of sixth greater with the third string, must be comma.

Second general Inference.

Hence is drawn this other general inference, That, among any number of strings tuned as a fiddle, when any one of them is stopped chord of sixth greater to the open string next below, that stop is comma flatter than the stop upon the same string which gives the chord of fourth with the next highest string; the first of these stops giving the interval of tone lesser, and the other giving the interval of tone greater to the same string open.

The next example shall be given to afford an opportunity of exhibiting the difference of the extremes of tune containing comma, to the ear in direct comparison; of forming thereby a judgment of such an error, and of the advantages which must result from its banishment.

It has been proved, that the lowest and highest of three strings tuned chord of fifth to each other give the interval called *ninth*, which is the same as octave to the second.

The second of the key is tone greater above the key-note. Supposing, then, the open third string to be assumed as a key-note; stop that string, so as to give the chord of fourth to the open second string: and preserving that position (Plate VIII. fig. 23.) for E' upon the third string, with the fourth finger stop E' upon the second string, octave to E' upon the third string, (fig. 24.). E' thus stopped upon the second string, will be found to be true unison to the open first string; which last was proved already (page 29.) to be the ninth of the key. Therefore E', thus taken upon the third string, is tone greater to the same string open, D. By inference second above, when a string is thus stopped chord of fourth to the next open string above it, it is comma sharper than when
stopped

stopped chord of sixth greater to the open string below. Again, stop the third string in E chord of sixth greater to the open fourth string G, (Plate VIII. fig. 25.); and after the chord is accurately adjusted, carefully preserve the position of this last found E, and take its octave with the fourth finger upon the second string, (fig. 26.). This last-mentioned E upon the second string will be found to be flatter than the tune of the open first string, and the difference is comma. A shocking difference it is, when thus brought into direct comparison; and it is not to be doubted, but that a performer would think himself highly affronted if he were told, that he is often so much, and sometimes much more, out of tune.

C H A P. IV.

Explanations preparatory to a particular examination of the regulated scales for the tune of the fiddle, and of the regulation of tune in general,

BEFORE examining particularly the regulated scales for the tune of the fiddle, it seems further necessary to premise some few things.

In the first place, whenever there shall be occasion to mention the keys of music as proceeding in their order, it must be understood to be meant of the order in which they arise from the natural key, either by the addition of sharp or of flat marks, without distinction of the greater and lesser mode, unless expressly specified. For example, when mention is made of the order of the keys with sharps, it is meant that the natural keys stand first in that order; and next, the keys with one, two, &c. sharps, to the keys with six sharps,

sharps, which are the last in that order.

In the same manner, when the order of the keys with flats is mentioned, it is meant, that the natural keys stand first in that order; and next, the keys with one, two, &c. flats, to the keys with five flats, which are the last in that order. And when the preceding key, or keys, to any particular key is mentioned, this expression points out the key or keys having one mark of flat or sharp fewer; and by the following key or keys, are meant those having one more of these marks. The word *signature* will be used, when both the major and minor mode, which are signed with the same sharp or flat marks, are meant to be expressed jointly. But there may be occasion sometimes to consider the keys in an order, beginning with five flats, and proceeding by those having one flat fewer towards the natural keys, and thence forward, by those having one sharp more each, to those with six sharps; the keys with five flats being the first, and those with six sharps the last, in this order. In

such case, the order meant shall be distinguished by the words, *order of five flats*; and when the reverse of this order is meant, it shall be distinguished by the words *the order of six sharps*. When the word *key* shall be used in the singular number, it must be understood to refer to one particular mode only. The word *keys* in the plural, if not limited, shall refer to the whole twenty-four keys of music. And because those parts of the harpsichord or organ by which the notes are struck are also called keys, for distinction's sake they shall be called *finger-keys*.

It must also be noticed, that the word *key* is sometimes used by musicians for expressing the whole system of tune belonging to one particular mode, and sometimes only to express the key-note. When the word *key* shall be used alone, it is to be understood in the former sense; the words *key-note* shall always be used when the note itself is meant.

We shall now offer a few general observations upon the transition from one key
to

to another in their order, before entering upon the examination of their regulation in particular.

In passing from the natural key major to the key major with one sharp, or from any key major with sharps to the succeeding key major in order with sharps, the fifth of the given key must be taken as key-note to the new key; consequently, the sixth of the given key now stands in place of the second of the new key. In the diatonick scale, the interval between the key-note and the second of the key is tone greater; but the interval between the fifth of the key major, and the sixth of the same, is tone lesser: therefore the sixth of the given key must be raised higher by comma, to make it a true second to the new key.

Also, the interval between the fourth and the fifth of the given key being tone greater, and that between the seventh and the eighth being semi-tone, the fourth of the given key must be raised limma major, so as to make it approach to the just distance

distance of semi-tone from the fifth, now become the key-note; by which alteration, it becomes a proper seventh to the new key: and these changes being made, all the other notes of the given key hold their pitch, and form true intervals for the new key.

The scale N^o 5. will help to a clear apprehension of the matter: where, from C upwards to an octave above G, the diatonick progress of the intervals is marked above the scale as proceeding from C, the natural key-note of the major mode; and from the lower G, as the new key-note for the key major with one sharp, the same progress of intervals is marked below the scale: which points out clearly what notes continue in the same pitch of tune common to both keys, and how much the others are to be altered.

Thus, in the tune of the key major natural C, the interval between G and A is marked tone lesser above the staff; but, in the key major G with one sharp, the interval between G and A is marked tone greater

greater below the staff, shewing that the tune of A, as it stands in the key of C natural, is comma too flat for the key of G with one sharp. A, therefore, being raised comma, it becomes a true second to G, now considered as a key-note.

Again, in the natural key major C, the interval between A and B is tone greater: but B being the third from the new key-note G, and the interval between the second and third of the natural key major being tone lesser, the interval between A and B ought to become tone lesser. But this is already effected in the correction of A just now made; which, for the reason given, was moved comma higher, thereby approaching to B, and diminishing the interval between A and B. Thus the interval between A and B is now become tone lesser; and consequently it stands in its true relation to the new key G, without any alteration of B.

The interval between B and C is femitone in the natural key of C; and these two notes, being the third and fourth of
the

the new key of G with one sharp, the interval between them there ought also to be semitone, and so needs no correction. Also, the intervals between C and D, and between D and E, are the same in both keys; but the intervals between E and F, and between F and G, standing in the key major C natural, as semi-tone and tone greater, and reciprocally in the key of G with one sharp, as tone greater and semi-tone. In order, therefore, to raise the tune of F in the key natural C, to the pitch it ought to hold in the new key of G with one sharp, it must be raised by a limma major, so as to approach to the just distance of semi-tone from G; and consequently become tone greater above E, the sixth of the key G. This last correction, in common practice, is signified by marking a sharp upon F, while the correction of the second of the new key is neglected.

Thus it appears, that, in altering the tune of an instrument from a given key, in the true diatonick tune of the greater mode,

mode, so that it may afford the same intervals of tune, when the fifth of that key is assumed as a key-note to another key major, two degrees of tune are only required to be altered; one, the sixth of the given key, which becomes second to the new key; and the other, the fourth of the given key, which becomes seventh to the new key.

If it should be required to tune one key major from another, by taking the fourth of the given key as a new key-note rather than the fifth, the same effect will be produced, if the method of proceeding be just reversed. Instead of raising the tune of the sixth and fourth of the given key as above, to adjust them to the tune of the new key, the second and seventh of the given key must be flattened. The second of the given key being flattened by comma, thereby becomes a true sixth to the new key; and the seventh of the given key being flattened by limma major, thereby becomes a true fourth to the new key: which last, in common practice, is
marked

marked with a flat, and the correction of the other is neglected.

While the derivation of one key from another proceeds by taking the fifth of each preceding key major in order, as the key-note of the succeeding key major, the notes to be altered from the pitch they hold in the given key must be corrected by raising their tune, and distinguishing each new key by an additional sharp mark. This course may be followed without much embarrassment, till it reaches to the signature of six sharps: but then these marks become so numerous, that it seems better to return to the natural keys, and to proceed anew from them, as it were by a reversed progression; the fourth of each preceding key becoming the new key-note, and a flat mark being added to the signature of the new key till the progress arrives at the signature of five flats. These, with the natural keys, and the six signatures with sharps, complete the twelve signatures; each signature comprehending a key major and a key minor;
in

in all, twenty-four keys, being the received system of music.

These two methods of deriving one key from another, by the addition of sharp or flat marks, make not the smallest difference in the connection or tune of the keys.

A little reflection will make it plain, that the sharp keys and flat keys thus derived, hold the same connection with each other in the general order of the keys from five flats to six sharps, as the flat keys do among themselves, or as the sharp keys do among themselves. The complete system of twelve signatures might be formed, by proceeding to derive one key from another, still taking the fifth of the last key as key-note to the succeeding key, and adding a sharp or double sharp mark; and the last of these would be in the signature of eleven sharps.

In such a case, the system of tune would be exactly the same as by the present method. The only difference would be, that that some of the signatures would be crowded by ^a~~the~~ multiplicity of sharp and double

double sharp marks. The same may be said if the whole keys should be formed in succession by the addition of flats, after the manner prescribed. But the use of both sharp and flat marks saves the inconvenience that would be occasioned by the multiplicity of marks which either of the other two methods would require in the advanced signatures.

From what has been said, the four following rules are deduced:

R U L E I.

For forming a key major with an additional sharp from the natural key major, or from any key major with sharps.

Take the fifth of the given key as the new key-note. Raise the fourth of the given key by limma major; which thereby becomes a true seventh to the new key. Raise also the sixth of the given key by comma; which thereby becomes the true second to the new key. All the other notes are of a pitch common to both keys.

R U L E

R U L E II.

For forming a key major with an additional flat, from the natural key major, or from any key major with flats.

Take the fourth of the given key as a new key-note. Flatten the seventh of the given key by limma major; which hence becomes a true fourth to the new key. Flatten also the second of the given key by comma; which hence becomes a true sixth to the new key. All the other notes are of a pitch common to both keys.

R U L E III.

For forming a key minor from a given key major of the same signature, see page 22. and scales N° 1. and 2.

Take the sixth of the key major of any given signature as the key-note for the minor of the same signature. Flatten the second of the key major by comma; which hence becomes a true fourth to the mi-
D nor.

nor. All the other notes are of a pitch common to both.

But musicians know, that in place of the sixth and seventh lesser, which are its natural and distinguishing notes, the key minor often requires its sixth and seventh greater. The tune of these must therefore also be found, for the occasional use of the minor mode.

R U L E IV.

For finding the tune of the major sixth and seventh of the minor mode.

Tune the sixth and seventh greater of the minor mode by the same relation of chords to the key-note, as the sixth and seventh of the major mode are tuned.

Before proceeding directly to the particular regulation of tune in the following scales, it is necessary still further to premise, That to be able the more distinctly to apprehend what precise pitch of tune
is

is meant to be expressed by each particular note; besides the common marks of flat and sharp, hitherto alone in use to distinguish, though grossly, the rise and fall of half a note, it is necessary, in treating of this refined regulation of tune, likewise to use other marks; and the grave (̀) and acute (´) accents are chosen. It will likewise be necessary to use a negative mark, having a similar effect upon these accents as the natural mark has upon the sharp and flat marks. A small cipher is chosen for this purpose; and the strictest attention must be paid to these marks.

The sharp, flat, and natural marks, and the acute, grave, and negative marks, are meant to be applied as follows. The degrees of the key major C natural, tuned by perfect diatonick intervals, shall be considered as the ground from which every other pitch of tune is derived, as it shall arise in proceeding through the other keys in order. The sharp, flat, and natural marks, shall always be used to signify precisely the rise or fall of the interval now

called the *limma major*. The word *limma* has been hitherto used inaccurately to signify half a tone in general; but the *limma major* must now be strictly understood to signify the remainder, after the elementary semi-tone $15 : 16$ has been subtracted from the tone greater $8 : 9$, being a ratio of $128 : 135$. The acute and grave marks, and their negative, shall be used also to signify precisely the rise or fall of comma. These grave and acute marks shall be placed on the beginning of each staff of music-lines, as well as the sharp and flat marks hitherto only in use; and they must be understood to influence the degrees of tune, on the lines and spaces upon which they are placed, in a similar manner.

The regulation of the tune of the fiddle, which is the subject of the two following chapters, is purposely inserted, prior to any further account of the properties of the scale of music, or the application of it to the tune of the organ; because it furnishes opportunity for great variety of experiments

experiments upon tune: and in all investigations of this kind experiment ought to lead the way.

It is true, that the scale of music, as it has already been exhibited in the introduction, supplies all the materials which are intended to be used in the following deductions; and it is also true, that it is derived from accurate experiments, made in the earliest times, which have stood the test of keen examination in all ages. But the few experiments upon the fiddle which have been premised, and the rest which follow, afford an opportunity of examining it upon an instrument with which we are familiarly acquainted; and shew so happy a coincidence with what has been delivered by theorists, that it is thought better to take this direct sanction from the senses along with us, than to proceed merely by reference to theory, without first laying hold of so easy an opportunity of examination.

Agreeable to the received doctrine concerning the system of musical keys, this

regulation of tune for the fiddle has been carried through all the twelve signatures, or twenty-four keys of music. But as the chain is long, and every link strictly dependent on another, to go thro' the whole at first may prove tedious to most inquirers. Two signatures, or at most three, carefully examined, will convey a pretty clear idea of the nature of the whole regulation, which becomes more intricate as it advances in numbers of sharps or flats; not from any alteration in the nature of the tune of the keys, but from the nature of the instrument, which becomes less fit to afford access to derive the tune of these advanced keys from the tune of the strings.

It may be recommended, however, to peruse part of Chap. VI. on the pitch of the keys with flats; and one or two of these may likewise be traced.

But, to a person who is altogether unacquainted with the practice of the fiddle, the examination of the simplest of these scales will be very difficult, if not impracticable.

ticable. Therefore it must be entirely relinquished; and the scale of music, as exhibited in the introduction, be admitted as true, without this additional testimony from the senses, in confirmation of what theorists have formerly established upon experiments differently made.

C H A P. V.

Of pitching the key-note C natural upon the fiddle, and hence regulating the tune of all the keys with sharps.

MANY reasons concur for choosing the tune of the open fourth string of the fiddle as the pitch for the tune of the fifth of the key major ~~or~~ C natural: for altho' it necessarily renders two of the open strings of the fiddle false to this key; yet upon the whole, it gives the easiest access to regulate the tune of the instrument, by appealing, in the simplest manner, to the

D 4 fixed

fixed tune of the open strings in general as a guide.

Another reason is, that the modulation from this key to the key major with one sharp is most natural; in which case, the open fourth string becomes the key-note. Were it otherwise pitched, it would be almost impossible to prevent the influence of the tune of the open fourth string from misleading the tune of both these keys. These reasons seem sufficient; and it is needless to add more, since the explanation of this matter at large would be tedious, and the remaining reasons may be referred to the reader's observation from the explanation to be given of the regulated scales. See N° 6. to N° 17.

To each of the signatures are given four staves of music-lines. The highest contains the tune of the key-major in true diatonick intervals. The second, marked flat sevenths and grave seconds, cannot be understood, till some particular properties of tune shall be explained afterwards in Part II.; and at present the degrees

grees of tune in that staff may be left unnoticed. The third staff represents the natural tune of the key minor; and the regulation of all its notes being the same with those set directly over them in the first staff of the major, the notes are simply marked, and the regulation of their tune referred to the highest staff: except the fourths, which by Rule 3. are comma flatter than the same notes of the major; and therefore their own regulation is given to them. The fourth staff contains the regulation of the fixths and fevenths greater of the minor, according to Rule 4. The regulation of these last could not properly be placed in the other staff of the minor; because it is necessary that the sixth and seventh of the minor, which are more particularly considered as natural to the key, should stand there, to indicate a reference to the regulation of their tune in the highest staff of the signature.

KEY

KEY MAJOR C NATURAL.

Of the Natural Keys; see Scale N° 6. Staff 1.

5th of the key, G. The tune of the open fourth string, as has been said, being assumed as the fifth of the key; and it having also been shewn (page 29.) that the pitch of tune which gives the chord of fifth above the fifth of any key, is a true ninth to the key, or, which is equivalent, is the second of the key; and the third string being tuned chord of fifth above the fourth string, these two strings open stand both in the true tune of this key; the open fourth string being the fifth, and the open third string being the second, of the key.

6th of the key, A. The interval between the fifth and the sixth of any key in the greater mode is tone lesser. See scale N° 3. But, by the same scale, the chord of sixth greater contains two tones greater, two tones lesser, and one semi-tone; from
which

which subtract a chord of fifth, viz. two tones greater, one tone lesser, and one semi-tone, the difference is one tone lesser. Stop the third string so as to give the chord of sixth greater above the open fourth string; and the difference between the tune of the open third string and the note thus stopped being such an addition to the chord of fifth (the tune of the third and fourth strings) as completes the chord of sixth greater, it must be the tone lesser. Transfer this position of the finger from the third to the fourth string, (which is done by stopping them squarely, so that when both are stopped they give the chord of fifth), and the note wanted is found, being A, the true sixth of this key: because this stop upon the fourth string, being to the tune of the same string open as the stop upon the third string was proved to be to the tune of that string open, that is, tone lesser; therefore A thus stopped upon the fourth string is tone lesser above the open fourth string, which is the fifth of the key.

7th of the key, B. The chord of third greater is composed of one tone greater and one tone lesser; and the chord of third lesser, of one tone greater and one semi-tone: the sum of these, being two tones greater, one tone lesser, and one semi-tone, is equal to the chord of fifth. The strings of the fiddle being tuned by fifths, and B the seventh of the key, by scale N° 3. being chord of third greater above the fifth of the key; stop the fourth string so as to give the chord of third lesser below the open third string, the remainder between that stop and the tune of the open fourth string must be a chord of third greater; and therefore the note B, thus stopped, is in the tune of the key.

Key-note, C. Let G upon the third string be stopped octave to the open fourth string, and that stop transferred, as before, from the third string to the fourth string by the chord of fifth; this stop, thus transferred upon the fourth string, shall be in the true pitch of the key-note C; for the chord of fifth being subtracted from an octave, the remainder

remainder is the chord of fourth. This transferred stop must therefore be higher than the tune of the open fourth string by the chord of fourth: But the tune of the open fourth string is the fifth of the key; therefore this transferred stop must be the key-note.

THIRD STRING.

2d of the key, D. The open third string D has already been shewn to be the just ninth, or second to this key; and therefore is tone greater above C. See also the first general inference, page 32.

3d of the key, E. E upon the third string, when tuned chord of sixth greater above the open fourth string, is tone lesser above the third string open, by the second general inference, page 35.; and the interval between the second and the third of the key in the greater mode (scale N° 3.) being tone lesser, E thus tuned is a just third to the key.

4th of the key, F. C, the key-note upon the fourth string, being found as before,
F upon

F upon the third string, which is the fourth of the key, must be taken chord of fourth higher.

5th of the key, G. G upon the third string, taken octave above the open fourth string, must be true fifth of the key.

6th of the key, A. But if the third string be stopped in the manner directed for G, (by inference first, p. 32.) the tune of the open second string is tone greater above G thus stopped; and by the scale N° 3. the interval between the fifth and the sixth of the key should only be the tone lesser: therefore the open second string is out of tune, being comma too sharp. But A below upon the fourth string being found as before, its octave, taken with the fourth finger upon the third string, gives the note wanted, which is comma flatter than the open second string. See pages 36. 37.

SECOND STRING.

7th of the key, B. If the second string be stopped chord of sixth greater above the open third string, by the second general

neral

neral inference, that stop gives the interval tone lesser above the same string open. By the regulation of A in the last article, that note is taken comma lower than the open second string; which is an addition to this interval equal to the difference between the tone lesser and the tone greater: therefore the second string being stopped in chord of sixth greater above the open third string gives the true tune of B, the seventh of the key; which, by scale N° 3. is tone greater above the sixth of the key.

Key-note, C. G being the fifth of the key, and the complement of the chord of fifth to octave being the chord of fourth; let G upon the third string, taken as before, regulate the tune of C upon the second string; which last being stopped chord of fourth above the former, is in tune.

2d of the key, D. D upon the second string being stopped octave above the open third string, which was shewn to be the
true

true second to the key-note below, becomes second of the key.

3d of the key, E. Between A the sixth of the key, counting upwards to E the third of the key, (see the scale N° 3.), is comprehended an interval of two tones greater, one tone lesser, and one semi-tone, being the just chord of fifth. But the open second string was found to be comma too sharp for A; therefore the open first string is also, by the same quantity, too sharp for E. Let, therefore, E upon the third string be tuned as already directed, and take its octave with the fourth finger upon the second string for the true tune of this note, it shall be comma flatter than the open first string. See pages 36. 37.

FIRST STRING.

4th of the key, F. C, the key-note, being taken as before upon the second string, stop F upon the first string chord of fourth above it.

5th of the key, G. D upon the second string
string

string being found as before, G upon the first string must be stopped chord of fourth above it; because D being the second of the key, it is tone greater above the key-note: but subtracting a tone greater from the chord of fifth, the remainder is a chord of fourth, and G is the fifth of the key.

6th of the key, A. C is the key-note upon the second string; and being stopped as before, A, its sixth, must be taken chord of sixth greater above; for the open second string being false, this note must not be made octave to it.

7th of the key, B. B upon the second string being stopped as before, directs to its octave upon the first string.

Key-note, C. C upon the second string being stopped as before, also directs to its octave upon the first string.

D upon the second string being stopped as before, directs to its octave upon the first string.

E

KEY

KEY MINOR A NATURAL.

SCALE N^o 6. STAFF 3.

By Rule III. p. 49. it is required that the second of the key major be flattened by comma, in order to become fourth of the key minor of the same signature; all the other notes of the key major being in true pitch for the key minor. By Rule IV. a sixth and a seventh greater must also be tuned for the occasional use of the minor. It would then be superfluous to repeat the regulation of the degrees of tune common to both keys: therefore, leaving these to be found in the first staff already prepared for the key major, we need only regulate these fourths in the third staff for this minor key; and, for the reason already given, another staff is added, for shewing the regulation of the sixths and sevenths greater.

The D's being the fourths of this lesser mode A natural, their pitch may be found as follows:

FOURTH

FOURTH STRING.

4th of the key, D'. In regulating the natural key of the greater mode, the tune of the open second string was found comma too sharp; and therefore the tune of A for that key was taken comma flatter upon the third string. Let this A upon the third string be found as before; and this stop upon the third string being transferred to the fourth string, it will give D' flatter by comma than the open tune of the third string. The grave mark must be added for the reasons already given, pages 50. 51.

SECOND STRING.

4th of the key, D'. A upon the first string, as regulated for the major mode, being octave to A upon the third string for the same, which is comma flatter than the tune of the open second string; let the stop for A upon the first string be taken as it stands in the first staff of this signature, and let that stop be transferred to the second string; it must give D' upon
E 2 the

the second string comma flatter than as it stands regulated for the key major.

FIRST STRING.

*Fourth of the key, D`.* The last-mentioned D` upon the second string being found, and taken on a shift, directs to its octave upon the first string. All these have the grave mark, to distinguish them from the pitch of the natural D's as they first arise in the key major.

FOURTH STRING. See Staff 4.

**7th of the key, *G`.* E, the fifth of the key minor, being found on the third string, stop \*G` upon the fourth string chord of sixth lesser below, because the seventh greater is chord of sixth lesser below the fifth of every key; and add the grave mark.

The reason is, that this *G`, thus tuned, is not raised full limma major above the pitch of G, the difference between these notes being truly limma minor. See Part II. This may be proved by a method of calculation afterwards to be

be given; which will shew, that all the sharp sixths and sharp sevenths of the minor keys ought also to be marked grave.

THIRD STRING.

*6th of the key, *F'. A, the key-note, being found upon the fourth string, as in the first staff of this signature, stop *F' upon the third string chord of sixth greater above it, and add the grave mark.

*7th of the key, *G'. The interval contained between the second and seventh greater of any key (counting upwards from the second) is equal to the chord of sixth greater, as may be seen in the scale N° 3. where that interval contains two tones greater, two tones lesser, and one semi-tone: therefore B, the second of this key, being found upon the fourth string as it is regulated in the first staff of the signature, stop *G' upon the third string chord of sixth greater above; and this stop shall give the true seventh greater to this key minor.

FIRST STRING.

*6th of the key, *F[^]. By the Scale N^o 3. the interval contained between the fourth and sixth greater of any key (reckoning upwards from the fourth) is chord of third greater. Let, therefore, the fourth of this key, viz. D[^] upon the second string, be found as before; and stop *F[^] upon the first string chord of third greater above.

*7th of the key, *G[^]. By the Scale N^o 3. the interval contained between the fifth and seventh greater above is equal to the chord of third greater. Let E, the fifth of this key, be found upon the second string, as before, (see staff 1.), and stop *G[^] upon the first string chord of third greater above,

KEYS WITH ONE SHARP.

SCALE N^o 7.

The signature having a sharp mark upon the place of F, which is the place of the seventh; and an acute mark upon the
place

place of A, which is the place of the second of this key.

KEY MAJOR with one SHARP.

See STAFF I.

F being the fourth of the preceding key major, and A being its sixth, by Rule I. page 48. all the other notes of the preceding key major are in the tune of the present. The former of these, F, must be raised by limma major, to become of a proper pitch as seventh; and the latter, A, must be raised comma, to become a true second to the present key.

Therefore, referring to the explanations already given of the tune of the other notes, and desiring the reader to compare the Scale for the major key N° 6. with the Scale N° 7. notice shall now only be taken of those notes of the key major N° 7. in which it differs from the former key major. The fourths natural, and the sixths and sevenths sharp of the key minor, must likewise be adjusted;

E 4

which

which will complete the examination of the Scale N° 7. : and so of every succeeding signature and its scales ; the investigation of the tune of which shall be referred to that of the preceding one, except in the notes to be altered.

FOURTH STRING.

2d of the key, A'. The tune of A upon the fourth string in the preceding key major is regulated by the transferring a stop from the third string, which was made chord of sixth greater, to the open string below. By the second general inference, if A upon the fourth string be now stopped chord of fourth below the open third string, A' thus stopped shall be comma sharper than as it stood pitched for the preceding key major : therefore, by Rule I. page 48, A' upon the fourth string stopped chord of fourth below the open third string is in true tune as second to the present key ; and it must have an acute mark, being comma sharper than A of the natural key. This acute mark is placed in
the

the signature, and must have a general influence over the key, in the same manner as the sharp mark is allowed to have in common practice.

THIRD and SECOND STRINGS.

2d of the key, A'. A', the tune of the second string, was found to be comma too sharp for the sixth of the preceding key major; therefore it is now in true tune as second of the present key: and counting upwards on the Scale N° 3. between the seventh greater and the second, that interval is found to contain one tone greater and one semi-tone, being equal to the chord

7th of the key, ♯F. of third lesser: therefore, if ♯F, the seventh of this key, is stopped upon the third string chord of third lesser below the open second string, it shall become a true seventh to this key. That it is also the just elementary semi-tone below the key-note is plain; because the interval between the key-note and the second of the key is tone greater; the complement

plement of which to the chord of third leffer is semi-tone.

This *F has no grave or acute mark affixed, being raised from the original F by a just interval of limma major; which is now understood to be represented precisely by the sharp, flat, and natural marks.

FIRST STRING.

*7th of the key, *F.* The interval between the second and the seventh greater, counting upwards from the second, contains two tones greater, two tones leffer, and one semi-tone; equal to the chord of sixth greater. Let *F upon the first string be stopped chord of sixth greater above the open second string; *F thus stopped is therefore the true seventh of this key.

2d of the key, A'. The open second string being the true second of this key, stop A' upon the first string octave above. A' thus stopped must also be true second to this key.

K E Y

KEY MINOR E with one SHARP.

SCALE N° 7. STAFF 3.

FOURTH STRING, and also THIRD and
FIRST STRINGS.

4th of the key, A°. The seconds of the key major to be flattened comma, to render them true fourths to the key minor of this signature, are the A's ; therefore these must be taken as they stand regulated for the key major of the former signature. This is done in the third staff of the Scale N° 7. where the A's are regulated by the same stops as they were in the first staff of N° 6. This may serve for a general rule while we proceed through the keys with sharps.

FOURTH STRING. See Staff 4. of Scale 7.

**6th of the key, *C°.* The sixth greater of any key being chord of third lesser below the key-note; find, as in the Scales, the key-note E upon the third string, and stop *C° upon the fourth string chord of
third

third leffer below, it is the true fixth greater of this key.

THIRD STRING.

*7th of the key, *D'. Find B the fifth of the key upon the fourth string, and stop *D' upon the third string chord of third greater above; it is the seventh greater of the key: for, by Scale N^o 3. the seventh greater is chord of third greater above the fifth of the same key.

SECOND STRING.

*6th of the key, *C'. A^o, the fourth of the key, being found by the Scales upon the third string, stop *C' upon the second string chord of third greater above. *C', thus stopped, is the true sharp fixth of the key.

7th of the key, *D'. Find *F, the second of this key minor, upon the third string, and stop *D' upon the second string chord of sixth greater above it; for the sharp seventh is chord of sixth greater above the second of every key.

FIRST

FIRST STRING.

※6th of the key, ※C'. Prepare ※C', as before, upon the second string, and take its octave upon the first string.

※7th of the key, ※D'. Also having prepared ※D', as before, upon the second string, take its octave upon the first string.

KEYS WITH TWO SHARPS.

See SCALE N° 8.

KEY MAJOR D with two SHARPS.
STAFF I.

The signature is the sharp mark continued upon the place of F, and another added upon the place of C, which last is the place of the seventh of this key; and the acute mark is continued upon the place of A, and likewise another acute mark added upon the place of E, which is the place of the second of this key.

C being the fourth and E the sixth of the preceding key major G with one sharp, by Rule I. p. 48. these are the only notes wherein

wherein the preceding key major differs from the present, and which must undergo an alteration of their pitch.

THIRD and FOURTH STRINGS.

2d of the key, E'. E, the sixth of the preceding key major upon the third string, is tuned chord of sixth greater above the open fourth string. But the note E being second to the present key, must, by the rule last quoted, be raised comma. By the second general inference, this may be done by stopping it chord of fourth below the open string above, as it is in this scale. The interval contained between the seventh major and the second of any key, *7th of the key, *C.* counting upwards from the seventh, being equal to the chord of third lesser: let *C upon the fourth string be stopped chord of third lesser below this E'; and thus it is a true seventh to this key. See the Scale.

FIRST and SECOND STRINGS.

2d of the key, E'. In the former key
major

major G with one sharp, the pitch of the first string open was found to be comma too sharp for the sixth of that key: consequently, by Rule I. p. 48. this pitch of tune must now be just as second of the present key. And if *C ^{7th of the key, *C.} upon the second string be stopped chord of third lesser below, according to the last article, it must also be a true seventh to this key.

FIRST STRING.

^{7th of the key, *C.} A' upon the first string being stopped octave to the open second string, it is the fifth of this key; and if to an octave there be added the chord of third greater, it is called a *chord of tenth greater*: therefore, if the first string be stopped chord of tenth greater above the open second string, it is the true seventh of this key.

KEY MINOR B with two SHARPS.

STAFF 3.

^{4th of the key, E°.} The fourths of this key,

key, the E°s, having been examined in the regulation of the key major of the preceding signature, to these reference is here made. They are marked with the negative sign.

FOURTH STRING. Staff 4.

*6th of the key, *G°. E°, the fourth of the key, being found, as in the Scale, upon the third string with the second finger, with the first finger stop *G' upon the fourth string chord of sixth lesser below; for from the sixth greater, counting upwards to the fourth of any key, there is an interval of sixth lesser, as may be seen upon the Scale N° 3.

*7th of the key, *A°. *F upon the third string is the fifth of this key. Stop, therefore, *A° upon the fourth string chord of sixth lesser below, it is the true sharp seventh of the key; for the sharp seventh of any key is chord of sixth lesser below the fifth of that key.

THIRD STRING.

*6th of the key, *G°. *G' upon the fourth
string

string being found as before, stop *G' upon the third string octave above.

SECOND STRING.

*7th of the key, *A°. Find *F, the fifth of this key upon the third string, and with the first finger stop *A° upon the second string chord of third greater above, it is the true seventh greater to this key; the seventh greater being chord of third greater above the fifth of any key.

FIRST STRING.

*6th of the key, *G'. Find E°, the fourth of the key, upon the second string; and stop *G', chord of third greater above it, upon the first string: *G', thus stopped, is the true sixth greater of the key; because the interval between the fourth and the sixth greater above is chord of third greater.

*7th of the key, *A°. Find *C, the second of this key upon the second string; and the seventh greater of any key being chord of sixth greater above its second, stop *A°

F

upon

upon the first string chord of sixth greater above; and this *A° must be a true sharp seventh to the key.

KEYS WITH THREE SHARPS.

See SCALE N° 9.

The signature is the sharp marks continued upon the places of F and C; and another added upon the place of G, the place of the seventh of this key. The acute marks are continued upon the places of A and E; and another added upon the place of B, the place of the second of this key.

KEY MAJOR A' with three SHARPS.

STAFF I.

FOURTH, and also THIRD and SECOND STRINGS.

The open first string E' is the fifth of this key, and B' upon the second string its second; the fifth of every key is acuter than

than the second by the chord of fourth:

2d of the key, B'. therefore if the second string be stopped in B' chord of fourth

below the open first string, that stop is the second of the key. The interval between the second and the seventh greater of any key, counting downwards from the se-

*7th of the key, *G.* cond, is chord of third lesser; stop *G upon the third string

chord of third lesser below this B', and it is the true seventh of this key. Hold this last stop, and remove the first finger from the second string to the fourth string;

*7th of the key, *G.* which being thereby stopped octave below *G upon the third string, it is also a true seventh to this key.

FOURTH STRING.

2d of the key, B'. E' is the fifth of this key; and the interval between the fifth of a key and its second downwards being chord of fourth, if the stop for E' be taken upon the third string, and the fourth string also stopped in B' chord of fourth

below, that stop must be a true second to the key.

THIRD STRING.

*7th of the key, *G.* The regulation of *G upon the third string, the seventh of this key, has been already examined in that of *G upon the fourth string in the preceding page.

SECOND STRING.

2d of the key, B'. See the regulation of B' upon the second string, preceding page.

FIRST STRING.

*7th of the key, *G.* By the scale N° 3. the seventh of the major mode is chord of third greater above its fifth. The open first string being the fifth of this key, stop the second string unison to the open first string, and the first string in *G chord of third greater above that unison upon the second string; *G upon the first string, thus

thus stopped, must be the true seventh of the key.

2d of the key, B'. See the regulation of *G upon the fourth string for the tune of B' upon the second string, and its octave upon the first string must also be a true second to the key.

KEY MINOR of *F with three SHARPS.

SCALE N° 9. Staff 3.

4th of the key, B°. For the fourths of the key, which are the B's, see the regulation of the B's of the key major of the preceding signature of two sharps.

THIRD STRING.

**6th of the key, *D'.* B°, the fourth of the key, being found, as before, upon the fourth string, stop *D' upon the third string chord of third greater above; for the sixth greater is chord of third greater above the fourth.

**7th of the key, *E°.* In like manner, *C upon the fourth string being found, which

F 3

is

is the fifth of the key, stop $\ast E^\circ$ upon the third string chord of third greater above; for the seventh greater is chord of third greater above the fifth.

SECOND STRING.

$\ast 6^{th}$ of the key, $\ast D'$. Find $\ast F$, the key-note by the scale, upon the first string, and stop $\ast D'$ upon the second string chord of third lesser below; for the sixth greater is chord of third lesser below the key-note.

$\ast 7^{th}$ of the key, $\ast E^\circ$. The seventh greater being chord of third lesser below the second of the key, by the scales, find $\ast G$ upon the first string, which is the second of this key; and stop $\ast E^\circ$ upon the second string chord of third lesser below.

FIRST STRING.

$\ast 6^{th}$ of the key, $\ast D'$. Find $\ast D'$ upon the second string, as before directed, and take its octave upon the first string.

KEYS WITH FOUR SHARPS.

SCALE N° 10.

The signature is the sharp marks continued upon the places of F, C, and G, and another added upon the place of D, the place of the seventh of this key: the acute marks also are continued upon the places of A, E, and B, and another added upon the place of F, the place of the second of the key.

KEY MAJOR E' with four SHARPS.

STAFF I.

FOURTH STRING.

*7th of the key, *D.* B' upon the second string is the fifth of this key; and the interval between the fifth and the second below, of any key, being chord of fourth, *2d of the key, *F'.* stop *F' upon the third string chord of fourth below B' stopped, as above, upon the second string; and it must be the true second of this key.

F 4

But

But the seventh greater of any key is chord of third lesser below its second: therefore stop $\ast D$, the seventh of this key upon the fourth string, chord of third lesser below $\ast F'$ stopped as before; and it is the true seventh of the key.

THIRD STRING.

2d of the key, $\ast F'$. In finding $\ast D$ in the last article, the regulation of $\ast F'$, the second of this key, is pointed out.

SECOND STRING.

7th of the key, $\ast D$. Let B' , upon the second string, the fifth of the key, be found; and this stop being transferred to the first string, is chord of fifth to the said B' .

2d of the key, $\ast F'$. By page 29. the fifth above the fifth of a key is its ninth or second. The seventh greater being chord of third lesser below the second of any key, stop the second string so as to give the chord of third lesser below $\ast F'$, found as above; and it must be $\ast D$, the true seventh of the key.

FIRST STRING.

*2d of the key, *F'.* For the regulation of *F', the second of the key upon the first string, see the preceding article.

*7th of the key, *D.* Take the octave of *D, found, as before, upon the second string, for *D, the seventh of the key upon the first string.

KEY MINOR *C with four SHARPS.

SCALE N° 10. Staff 3.

*4ths of the key, *F°s.* Compare the regulation of the *F°s, the fourths of this key, with that of the *F's of the major of the preceding signature.

FOURTH STRING.

**6th of the key, *A°.* *F°, the fourth of this key upon the third string, being found as above, stop *A° upon the fourth string chord of sixth lesser below it; for the sharp sixth is chord of sixth lesser below the fourth of any key.

**7th of the key, *B°.* Find *G, the fifth of this key, as in the scales, upon the
third

third string, and make $\ast B^\circ$ upon the fourth string chord of sixth lesser below. This $\ast B^\circ$ is the seventh greater of the key, by Rule IV.

SECOND STRING.

$\ast 6th$ of the key, $\ast A^\circ$. $\ast F^\circ$, the fourth of this key upon the third string, being found as above, stop $\ast A^\circ$, the sixth greater upon the second string, chord of third greater above it.

$\ast 7th$ of the key, $\ast B^\circ$. $\ast G$, the fifth of this key, being found upon the third string, stop $\ast B^\circ$ upon the second string chord of third greater above; it is the true seventh greater of this key.

FIRST STRING.

$\ast 6th$ of the key, $\ast A^\circ$. $\ast A^\circ$ upon the second string being found as before, which is the sixth greater to this key, take its octave upon the first string.

$\ast 6th$ of the key, $\ast B^\circ$. Make $\ast B^\circ$ upon the first string octave to $\ast B^\circ$ upon the second string, prepared as before.

K E Y S

KEYS WITH FIVE SHARPS.

SCALE N^o 11.

The signature is the sharp marks continued upon the places of F, C, G, and D, and another added upon the place of A, the place of the seventh of this key: the acute marks are also continued upon the places of A, E, B, and F; and another added upon the place of C, the place of the second of this key.

KEY MAJOR B' with five SHARPS.

STAFF 1.

FOURTH STRING.

*7th of the key, *A'.* The seventh greater of any key is chord of sixth lesser below its fifth. Let *F', the fifth of this key, be found upon the third string, and stop *A' upon the fourth string chord of sixth lesser below; it is the true seventh of this key.

FOURTH

FOURTH STRING.

*2d of the key, *C'.* Find *F' upon the third string, which is the fifth of this key, and stop *C' upon the fourth string chord of fourth below; it must be the true second of this key.

SECOND STRING.

*7th of the key, *A'.* The fifth of the key *F' upon the third string being found as before, stop *A' upon the second string chord of third greater above; it is the true seventh of this key.

*2d of the key, *C'.* The same *F' upon the third string directs to *C' upon the second string; which being stopped chord of fifth above, is the true second of this key.

FIRST STRING.

*7th of the key, *A'.* *D, the third of the key upon the second string, being found, and the interval between the third greater and the seventh greater being chord of

of fifth, (see scale N^o 3.); find *A' upon the first string, by transferring the stop for *D from the second to the first string.

*2d of the key, *C'.* *C', the second of this key, being found, as before, upon the second string, its octave upon the first string is the note wanted.

KEY MINOR *G with five SHARPS.

STAFF 3.

*4ths of the key, *C^os.* The fourths of this key being the *C^os, the tune of these is regulated in the same manner with that of the *C's of the key major of the preceding signature.

THIRD STRING. Staff 4.

*6th of the key, *E^o.* Find *C^o, the fourth of this key, as before, upon the fourth string; and make *E^o, the sixth greater upon the third string, chord of third greater above.

**7th of the key, *F^o.* Find *D upon the
fourth

fourth string, being the fifth of this key ; and make *F°, the seventh greater of this key upon the third string, chord of third greater above.

SECOND and FIRST STRINGS.

*6th and *7th of the key, *E° and *F°. The two last articles sufficiently explain the pitch of these notes taken octave higher.

KEYS WITH SIX SHARPS.

SCALE N° 12.

The signature is the sharp marks continued upon the places of F, C, G, D, and A ; and also another added upon the place of E, the place of the seventh of this key. The acute marks are also continued upon the places of A, E, B, F, and C ; and another added upon the place of G, the place of the second of this key.

KEY

KEY MAJOR $\sharp F'$ with six SHARPS.

STAFF I.

THIRD and FOURTH STRINGS.

2d of the key, $\sharp G'$. $\sharp C'$, the fifth of this key upon the second string, being found by the scale, stop $\sharp G'$, the second of this key upon the third string, chord of fourth below it. $\sharp G'$ thus stopped is the true second of the present key; and its octave below, taken upon the fourth string, must also be true second to the key.

THIRD STRING.

7th of the key, $\sharp E'$. $\sharp C'$ upon the fourth string, which is the fifth of this key, being found as in the scale; and the interval between the fifth and the seventh greater being chord of third greater; stop $\sharp E'$ upon the third string chord of third greater above $\sharp C'$ upon the fourth string.

2d of the key, $\sharp G'$. The regulation of $\sharp G'$, the second of this key upon the third string, is shewn in that of $\sharp G'$ upon the fourth string.

SECOND

SECOND STRING.

*7th of the key, *E'.* *E' upon the third string being found as before, stop *E' upon the second string octave above it.

FIRST STRING.

*2d of the key *G'.* *C' upon the second string being found, stop *G' upon the first string chord of fifth above it; for the second of any key is always chord of fifth above its fifth.

KEY MINOR *D with six SHARPS.

STAFF 3.

*4ths of the key, *G°s.* See the regulation of the *G's in the key major of the preceding signature, which are of the same pitch with the *G°s, the fourths of the present key minor.

FOURTH STRING. Staff 4.

**6th of the key, *B°.* The sixth greater of any key is chord of sixth lesser below its fourth. Find, therefore, *G° upon the
third

third string, and stop *B° upon the fourth string chord of sixth lesser below.

*7th of the key, *C°. Likewise the seventh greater of any key is chord of sixth lesser below its fifth. Find, therefore, *A' upon the third string, which is the fifth of this key minor, and stop *C° upon the fourth string chord of sixth lesser below.

SECOND STRING.

*6th of the key, *B°. The same steps which direct to *B° upon the fourth string, direct also to *B° upon the second string; only the last step is taken a chord of third greater upwards, instead of the chord of sixth lesser downwards; for the chord of third greater, added to the chord of sixth lesser, are equal to octave.

*7th of the key, *C°. *A', the fifth of this key minor upon the first string, being found, stop *C° upon the second string chord of sixth lesser below it; for the same reason given in the regulation of *C° upon the fourth string.

G

FIRST



FIRST STRING.

*6th and *7th of the key, *B° and *C°. These two notes, found upon the second string as before, direct to their octaves upon the first string.

C H A P. VI.

Of pitching the key-note F' for the key major with one flat, and hence deriving the regulation of all the keys with flats.

IN proceeding to regulate the keys of the violin with flats, it seems necessary to relax a little from the strict uniformity, although not properly from the strict accuracy, of tune, in the transition from the keys natural to those with flats: and this by admitting the key-note of the key major F with one flat comma sharper than the pitch of that note, as it stands fourth of the key major C natural.

Since

Since all the keys with flats derive their pitch from F', by this alteration all the notes of these keys with flats, though in perfect tune to each other, will stand comma sharper than they would do if formed from the true pitch of the fourth of the key major C natural.

The reason is, that if the regular connection hitherto observed should in this instance be rigidly pursued, and the key-note F be taken in the same pitch it holds in the natural key major, the regulation of the keys with flats would immediately run out of the reach of practice. This may be a sufficient apology for such a deviation, not properly productive of any false interval, but only of an irregularity in the formation of the keys.

Besides what shall afterwards be said to shew that composers have it in their power to modulate thro' this irregularity without admitting any false interval, it may be here observed, that the composer, or transposer of composition, has a range of fourteen keys natural and with sharps, and

of ten keys with flats ; keeping within the limits of either of which, he leaves the violin-performer in possession of rules which direct to perfect tune in the most regular connection ; for the natural keys, and those from one to six sharps, are regularly connected. These seven signatures, having each a major and a minor mode, afford a scope of fourteen regularly connected keys ; and the signatures from one to five flats afford a scope of ten keys, also regularly connected.

KEYS WITH ONE FLAT.

SCALE N° 13.

By Rule II. page 49. if the fourth of a key be taken as a new key-note, from which another key is to be formed, the seventh of the given key must be flattened limma major, and the second must be flattened comma, to adapt them to the tune of the new key. Therefore, in forming this key major with one flat from the key
major

C natural, the seventh of the key natural, which is B, would receive the flat mark, and its second, D, the grave mark: all the other notes would remain without any mark at all upon the signature on their places. But since the key must be pitched comma higher than it regularly ought, for the reason already given, in order to preserve a clear idea of the pitch of tune, compared with that of the keys already regulated, D alone might be left unmarked, and the acute mark affixed to each of the other notes of the key. But it seems better to affix an acute mark to D, as well as to all the other notes; and to take off its effect again by adding the negative mark, in the same manner as must be done by the other notes in their course.

Thus the whole notes of this key, being comma higher than they ought, if uniformly connected with the keys already regulated, are in this manner marked; and therefore, instead of adding a grave mark to each succeeding signature

order, an acute mark must be taken off. To do this, the best method seems to be to allow the acute marks to remain in their places, and to add the negative mark, where the uniformly connected system of tune for the organ will have a grave mark,

KEY MAJOR F' with one FLAT.
SCALE N° 13. Staff 1.

THIRD STRING.

Key-note F'. F', the key-note upon the third string, is stopped chord of third greater below the open second string. This stop is comma higher than F, as it is regulated in the key major C natural: for the interval between the fourth, and the sixth greater above, is equal to the chord of third greater; but A, the sixth of the key major natural, was found to be comma flatter than the open second string; therefore F in the natural key major, which is chord of third greater below A of the same key, must

must be comma flatter than F' when stopped chord of third greater below the open second string. The fourth of this key, however, has its flat mark, as well as it would have had if properly pitched to the former key; but it has also an acute mark, which it would not otherwise have had.

The whole tune of this key major must be particularly explained: because the connection of tune with the natural keys being broken, prohibits reference to the tune of the key major of the preceding signature for the regulation of notes common to both; as hitherto has been done, and may afterwards be done when the first key major of this new pitch of tune has once been regulated.

FOURTH STRING.

17. The key-note F' upon the third string being pitched as above, the open second string is third to the key; and the interval between the third, and the seventh greater above, of any key major, being

G 4

chord

chord of fifth, the open first string is the true seventh to this key so pitched. But the interval between the second, and the seventh greater above, being chord of sixth greater; if G' upon the third string be stopped chord of sixth greater below the unison of the first string taken upon the second string, by the first general inference, page ³²~~37~~, G' thus stopped is comma sharper than G stopped octave to the open fourth string; and its octave below must consequently be comma higher than the open fourth string. To stop the fourth string just comma sharper than the open string, seems so exceedingly difficult, that it were better to consider the instrument as wanting this note, than to attempt such a stop: therefore, without regulating this note, the mark of reference (w) is affixed to it, to signify that defect.

It may here be asked, If the open fourth string, being false to this key, may not influence and mislead the tune of the key, as well as it would do if false to the natural

tural key major C, or to the key major G with one sharp?

In the key major F with one flat, G is the second of the key. The second is always one of the least characteristic notes belonging to a key, whilst the key-note itself is the ground-note upon which all the rest depend; and the fifth of the key is next in importance to the key-note itself. G is fifth to the natural key major, and key-note to the key major with one sharp; the open fourth string could not, therefore, without great disadvantage, be made false to these keys. But, as second to the key major with one flat, this lowest note of the instrument may be well enough spared.

FOURTH STRING.

3d of the key, A'. The interval between the sixth greater, and the third greater above, is chord of fifth. See Scale N° 3. The open second string being third to this key, the open third string must therefore be sixth to it; and the interval

val

val between the third, and sixth greater above, being chord of fourth, if A' upon the fourth string be stopped chord of fourth below the open third string, that stop is a true third to the key.

4th of the key, $\flat B'$. The open third string, D°, has been found in the last article to be true sixth of the key. But the fourth is always chord of third greater below the sixth greater: stop, therefore, $\flat B'$ upon the fourth string chord of third greater below the open third string D°; and it is the true fourth of the key.

5th of the key, C'. The interval between the fifth, and third greater above, is chord of sixth greater. Stop, therefore, C' upon the fourth string chord of sixth greater below the unison of the open second string, taken upon the third string; and that stop must be the true fifth to the key.

THIRD STRING.

6th of the key, D°. D°, the open third string, has already been shewn to be the true sixth of this key.

7th of the key, E'. The interval between the seventh greater, and the third greater above, is chord of fourth; if therefore E' upon the third string be stopped chord of fourth below the open second string, it shall be a just seventh to this key.

Key-note F'. The tune of the key-note F' upon the third string has already been shewn, page 102.

2d of the key, G'. For the regulation of G' upon the third string, see page 104.

SECOND STRING.

3d of the key, A'. For A' , the open second string, which is the third of this key, see page 102.

4th of the key, bB' . The interval between the sixth greater, and the fourth above, is chord of sixth lesser: if, therefore, bB' upon the second string be stopped chord of sixth lesser above the open third string, it is in just tune to this key.

5th of the key, C'. The open first string was shewn, page 104, to be the true seventh

venth to this key; but the interval between the fifth, and the seventh greater above, is chord of third greater: if, therefore, C' upon the second string be stopped chord of third greater below the open first string, it must be the true fifth of the key.

6th of the key, D°. D°, the sixth of the key upon the second string, is found by stopping that string octave to the open third string, which was already shewn to be the sixth of the key.

FIRST STRING.

7th of the key, E'. The open first string was shewn already to be the true seventh of the key. See page 104.

Key-note F'. The open second string being the third of the key, and the complement of the third greater to the octave being chord of sixth lesser; if F' upon the first string be stopped chord of sixth lesser above the open second string, it is octave to F', the key-note, as before, upon the third string.

2d of the key, G'. The interval between
the

the seventh greater, and the second of the key above, is chord of third lesser: if, then, the unison of the first string open be taken upon the second string, and G' be stopped upon the first string chord of third lesser above, G' so taken is the second of the key.

3d of the key A'. Stop A' upon the first *string* octave above A' the open second string, it shall be a true third to the key.

4th of the key bB'. bB' upon the second string being found as before, if bB' upon the first string be stopped octave above, it must also be a true fourth of the key.

5th of the key C'. A' the second string open is the third of this key, and the interval between the third, and the fifth of the key above, is chord of third lesser; but the chord of third lesser, added to an octave, is chord of tenth lesser: if, therefore, C' upon the first string be stopped chord of tenth lesser above the open second string, it is in tune.

6th of the key, D°. D° upon the second string being found as before, its octave
upon

upon the first string is in tune as sixth of the key.

KEY MINOR D° with one FLAT.

SCALE 13. Staff 1.

By Rule III. p. 49. the seconds of the key major must be flattened comma, that they may become true fourths to the minor of the same signature.

FOURTH STRING.

4th of the key, G°. The seconds of the key major to be flattened comma, being the G's; and the open fourth string having been found comma too flat for the pitch of G' in the key major, it is of course in the just pitch of tune for G°, the fourth of the key minor.

THIRD STRING.

4th of the key, G°. The third string stopped octave above the open fourth string

string must also be in true tune for G° in this key.

FIRST STRING.

4th of the key, G°. D°, the sixth of the key major, and key-note of the present key minor, being found, as in the Scale, upon the second string, stop G° upon the first string chord of fourth above.

FOURTH STRING. Staff 4.

**6th of the key, ♯B°.* The interval between the fourth, and the sixth greater of any key below, being chord of sixth lesser; find G°, the fourth of this key upon the third string, and stop ♯B°, its sixth greater upon the fourth string, chord of sixth lesser below.

**7th of the key, *C°.* The interval between the fifth of any key, and its seventh greater below, being chord of sixth lesser, stop *C° upon the fourth string chord of sixth lesser below the unison of the open second string, which is the fifth of the key.

SECOND STRING.

*6th of the key, $\sharp B^\circ$. $\sharp B^\circ$ upon the second string is taken, in the Scales, as chord of sixth greater above the open third string, which last is the key-note; therefore $\sharp B^\circ$ thus stopped must be the sharp sixth of the key.

*7th of the key, $\ast C^\circ$. The interval between the seventh greater of any key, and its second above, is chord of third lesser; and the first string open being the second of this key, if $\ast C^\circ$ upon the second string be stopped chord of third lesser below the open first string, it is a true seventh greater to this key.

FIRST STRING.

*6th and *7th of the key, $\sharp B^\circ$ and $\ast C^\circ$. $\sharp B^\circ$ and $\ast C^\circ$ upon this string, being stopped octave above the former $\sharp B^\circ$ and $\ast C^\circ$ upon the second string, they are the true sixth and seventh greater to this key.

KEYS

KEYS WITH TWO FLATS.

SCALE N° 14.

The signature is the flat mark continued upon the place of B, and another added upon the place of E, the place of the fourth of the present key major. The negative mark is also continued upon the place of D, and another added upon the place of G, the place of the sixth of the present key major.

KEY MAJOR $\flat B'$ with two FLATS.

STAFF I.

FOURTH STRING.

6th of the key, G°. The second of the preceding key major being comma sharper than the tune of the open fourth string, by Rule II. page 49. the open fourth string is a true sixth to this key.

THIRD STRING.

4th of the key, $\flat E'$. The open fourth
H string

string being sixth of this key, the open third string must be third to it; and the chord of sixth lesser being compounded of the chord of fifth and semi-tone, stop $\flat E'$ upon the third string chord of sixth lesser above the open fourth string; and the difference between that stop and the open third string must be semitone. $\flat E'$ thus stopped is therefore true fourth to the key.

6th of the key, G° . G° upon the third string, stopped octave above the open fourth string, must be sixth of the key; for the open fourth string has been shewn to be sixth of the key.

SECOND STRING.

4th of the key, $\flat E'$. $\flat E'$ upon the second string stopped octave above the former $\flat E'$ upon the third string, must also be the fourth of the key.

FIRST STRING.

6th of the key, G° . The interval between the third greater, and the sixth greater above,

above, being chord of fourth, find D°, the third of this key upon the second string, and stop G° upon the first string chord of fourth above.

KEY MINOR G° with two FLATS.

SCALE N° 14. Staff 3.

FOURTH STRING.

4th of the key, C°. Find G° upon the third string, which is the key-note, and stop C° upon the fourth string chord of fifth below, it is the true fourth of this key minor.

SECOND STRING.

4th of the key, C°. G° upon the third string, which is the key-note, being found, stop C° upon the second string chord of fourth above.

FIRST STRING.

4th of the key, C°. C° upon the first string must be taken octave above C° upon the second string, found as before.

H 2

THIRD

THIRD STRING.

*6th of the key, $\sharp E^{\circ}$. Stop $\sharp E^{\circ}$ upon the third string chord of sixth greater above the key-note or open bass.

*7th of the key, $\ast F^{\circ}$. Stop $\ast F^{\circ}$ chord of third lesser below the open second string, which is second of the key. $\ast F^{\circ}$ thus stopped is the true seventh greater to the key, for the reasons often already assigned.

SECOND STRING.

*6th of the key, $\sharp E^{\circ}$. Find $\sharp E^{\circ}$, the sixth greater of this key upon the third string, as before directed, and take its octave upon the second string.

FIRST STRING.

*7th of the key, $\ast F^{\circ}$. Find D° upon the second string, which is the fifth of this key, and make $\ast F^{\circ}$ upon the first string chord of third greater above.

KEYS

KEYS WITH THREE FLATS.

SCALE N^o 15.

The signature is the flat marks continued upon the places of B and E, and another added upon the place of A, the place of the fourth of the key. The negative marks are likewise continued upon the places of D and G, and another added upon the place of C, the place of the sixth of the key.

KEY MAJOR $\flat E'$ with three FLATS.

STAFF I.

FOURTH STRING.

4th of the key, $\flat A'$. Find $\flat E'$ upon the third string, which is the key-note, and stop $\flat A'$ upon the fourth string chord of fifth below. $\flat A'$ thus stopped is the true fourth of the key.

6th of the key, C° . Find G° upon the third string, which is the third of the

H 3

present

present key, and stop C° upon the fourth string chord of fifth below; for the sixth is always chord of fifth below the third of the major mode.

THIRD STRING.

4th of the key, bA' . bA' upon the fourth string being found as before, stop bA' upon the third string octave to it.

SECOND STRING.

6th of the key, C° . Find G° , the third of the key upon the third string, as in the Scale; and the interval between the third greater, and the sixth greater above, being chord of fourth, stop C° upon the second string chord of fourth above G° so found.

FIRST STRING.

4th of the key, bA' . bE' , the key-note, being found, as in the Scale, upon the second string, stop bA' upon the first string chord of fourth above.

6th of the key, C° . C° upon the second string

string being found as before, stop C° upon the first string octave above.

KEY MINOR C° with three FLATS.
STAFF 3.

THIRD STRING.

4th of the key, F°. C°, the key-note upon the fourth string, being pitched as it stands in the key major of this signature, stop F° upon the third string chord of fourth above it,

FIRST STRING.

4th of the key, F°. F° upon the third string being thus found, F° upon the first string, made octave above, must be in tune. But as these cannot be struck in consonance, this octave may be found by ascending the steps of fifth and of fourth, as in the Scale.

FOURTH STRING. Staff 4.

**6th of the key, A°.* Find F°, the fourth
H 4 of

of this key, upon the third string, as before, and make $\sharp A^\circ$, the sixth greater of the key upon the fourth string, chord of sixth lesser below it; because the sixth greater is chord of sixth lesser below to the fourth of the same key.

**7th of the key, $\sharp B^\circ$.* The open third string is the second of this key; therefore $\sharp B^\circ$ upon the fourth string, stopped chord of third lesser below it, is the seventh greater of the key.

THIRD STRING.

**6th of the key, $\sharp A^\circ$.* Find the key-note C° upon the fourth string, and stop $\sharp A^\circ$ upon the third string chord of sixth greater above.

SECOND STRING.

**7th of the key, $\sharp B^\circ$.* The interval between the second, and the seventh greater above, is chord of sixth greater: stop, therefore, $\sharp B^\circ$ upon the second string chord of sixth greater above the open third string; this

this stop gives the true seventh greater to the key.

FIRST STRING.

*6th of the key $\flat A^\circ$. Find the key-note upon the second string, and stop $\flat A^\circ$ upon the first string chord of sixth greater above.

*7th of the key, $\flat B^\circ$. And make $\flat B^\circ$ upon the first string octave to $\flat B^\circ$ upon the second string.

KEYS WITH FOUR FLATS.

See SCALE N^o 16.

The signature is the flat marks continued upon the places of B, E, and A, and another added upon the place of D, the place of the fourth of this key; and also the negative marks continued upon the places of D, G, and C, and another added upon the place of F, the place of the sixth of this key.

KEY

KEY MAJOR $\flat A'$ with four FLATS,
SCALE N° 16. Staff 1.

FOURTH STRING.

4th of the key, $\flat D^\circ$. Find $\flat A'$ upon the third string, which is the key-note, and stop $\flat D^\circ$ upon the fourth string chord of fifth below it; $\flat D^\circ$ thus stopped is the true fourth of the key.

THIRD STRING.

6th of the key, F° . Find C° upon the fourth string, which is the third of the key, and stop F° upon the third string chord of fourth above it: F° thus stopped is the true sixth of this key.

SECOND STRING.

4th of the key, $\flat D^\circ$. $\flat A'$ upon the third string being the key-note, stop $\flat D^\circ$ upon the second string chord of fourth above it: $\flat D^\circ$ thus stopped is the true fourth of the key.

FIRST

FIRST STRING.

6th of the key, F°. C°, the third of this key, being found upon the second string, directs to F° upon the first string; which last being stopped chord of fourth above the former, is true sixth of this key.

4th of the key, bD°. From bD°, regulated, as above, upon the second string on a shift, its octave on the first string may be found.

KEY MINOR F° with four FLATS.

STAFF 3.

FOURTH STRING.

4th of the key, bB°. Find F°, the key-note upon the third string, and stop bB° upon the fourth string chord of fifth below it: bB° thus stopped is the true fourth of this key minor.

SECOND STRING.

4th of the key, bB°. F°, the key-note upon the third string, directs to bB° upon the

the second string, to be stopped chord of fourth above it.

FIRST STRING.

4th of the key, $\flat B^\circ$. $\flat B^\circ$ upon the first string is found by taking it octave directly to $\flat B^\circ$ upon the second string, found as before.

FOURTH STRING. Staff 4.

**6th of the key, $\sharp D'$.* Find the key-note upon the third string, and stop $\sharp D'$ upon the fourth string chord of third lesser below it.

THIRD STRING.

**7th of the key, $\sharp E^\circ$.* The open fourth string is the second of this key minor, and the interval between the second, and seventh greater above, is chord of sixth greater. Stop, therefore, $\sharp E^\circ$ upon the third string chord of sixth greater above the open fourth string, and it is true seventh greater of this minor key.

SECOND

SECOND STRING.

*6th of the key, $\sharp D^{\flat}$. Find the key-note upon the third string, and stop $\sharp D^{\flat}$ upon the second string chord of sixth greater above it.

*7th of the key, $\sharp E^{\circ}$. Let $\sharp E^{\circ}$ upon the second string be taken octave to $\sharp E^{\circ}$ already found upon the third string.

*6th of the key, $\sharp D^{\flat}$. $\sharp D^{\flat}$ upon the first string may be found by making it octave above $\sharp D^{\flat}$ already found upon the second string.

KEYS WITH FIVE FLATS.

SCALE N^o 17.

The signature is the flat marks continued upon the places of B, E, A, and D; and another added upon the place of G, the place of the fourth of this key: also the negative marks continued upon the places of D, G, C, and F; and another added upon the place of B, the place of the sixth of this key.

KEY

KEY MAJOR $\flat D^{\circ}$ with five FLATS.

SCALE N^o 17. Staff 1.

FOURTH STRING.

w. The open fourth string being the seventh of the key major $\flat A'$ with four flats, should be flattened limma major, to make it true fourth to the present key: but this is beyond the reach of the fiddle; and therefore the mark of reference is put in its place, to shew that it is wanting.

6th of the key, $\flat B^{\circ}$. Find F° , the third of this key on the third string, and stop $\flat B^{\circ}$ upon the fourth string chord of fifth below it: $\flat B^{\circ}$ thus stopped is true sixth of the key.

THIRD STRING.

4th of the key, $\flat G^{\circ}$. Find the key-note $\flat D^{\circ}$ upon the fourth string, and stop $\flat G^{\circ}$ upon the third string chord of fourth above it.

FOURTH

SECOND STRING.

6th of the key, $\flat B^\circ$. F° , the third of this key, being found on the third string, directs to $\flat B^\circ$ upon the second string; which last being stopped chord of fourth above the former, is true sixth of this key.

FIRST STRING.

4th of the key, $\flat G^\circ$. Find the key-note upon the second string, and stop $\flat G^\circ$, the fourth of the key upon the first string, chord of fourth above it.

6th of the key, $\flat B^\circ$. Find $\flat B^\circ$ upon the second string, and stop $\flat B^\circ$ upon the first string octave above the former; it is true sixth of the key.

KEY MINOR $\flat B^\circ$ with five FLATS.

STAFF 3.

THIRD STRING.

4th of the key, $\flat E^\circ$. Find $\flat B^\circ$, the key-note upon the the fourth string, and stop $\flat E^\circ$ upon the third string chord of fourth above

above it: $\flat E^\circ$ thus stopped is true fourth of this key.

SECOND STRING.

4th of the key, $\flat E^\circ$. Find $\flat E^\circ$, as before, on the third string, and stop $\flat E^\circ$ upon the second string octave above the former.

FOURTH STRING.

**7th of the key, $\sharp A^\circ$.* Find F° , the fifth of this key on the third string, and stop $\sharp A^\circ$ upon the fourth string chord of sixth lesser below; it is true seventh greater of this key.

THIRD STRING.

**6th of the key, $\sharp G^\circ$.* Find the key-note upon the second string, and stop $\sharp G^\circ$ upon the third string chord of third lesser below it; it is true sixth greater of this key.

**7th of the key, $\sharp A^\circ$.* Find $\sharp A^\circ$, the sharp seventh of this key upon the fourth string, as before directed, and stop $\sharp A^\circ$ upon the third string octave above it.

FIRST

FIRST STRING.

*6th of the key, $\sharp G^\circ$. Find $\flat B^\circ$, the key-note upon the second string, and stop $\sharp G^\circ$ upon the first string chord of sixth greater above.

*7th of the key, $\sharp A^\circ$. Find $\sharp A^\circ$ upon the third string, as directed above, and from it ascend to $\sharp A^\circ$ upon the first string by the chords of fifth and fourth.

These scales, or rather those among them which have their signatures much crowded with marks, are not contrived so much with a view to practice, as to shew, in the most evident manner, the connection of tune. Upon that account, there are several steps admitted into many of the regulations which might be set aside; and hence the trial of tune, in these particular cases, would be greatly facilitated. For example, $\sharp A^\circ$, the sharp seventh of the key minor with five flats upon the first string, has no less than seven preparatory chords, which may be reduced to three, as it is shewn in an annexed regulation of

that note. This is found by a method of calculation, which shall be afterwards used in treating of the tune of the organ; but of which we cannot now avail ourselves, whilst the regulation of tune for the fiddle in each key is derived from that of the preceding key. The keys commonly in use are very simple and practicable.

It seems unnecessary to carry these scales higher than the pitch of D, upon what is commonly called the *full shift*; for when these are well understood, performers will of themselves know how to put in practice what remains. The methods of taking the higher shifts being so exceedingly various, it would be endless to attempt to regulate them; nor, without much trouble and explanation, could a few examples be understood by those who cannot now of themselves apply what has been shewn to new cases.

It seems agreed amongst people of good taste, that performance upon the higher shifts serves chiefly to excite admiration
of

of dexterity, often at the expence of true musical sentiment. It were to be wished that performers would rather direct their attention towards the attainment of true tune; and in this department a field almost boundless for exercise seems to lie before us.

C H A P. VII.

Of the advantages arising from the regulated scales; and of the capacity of the ear.

HAVING examined the tune of the treble fiddle in all its keys, admitting a single deviation only from the uniformity of connection; to shew the necessity of this, the reader may be informed, that an attempt has been made to pursue the regular connection of tune from the natural keys to the keys with four

flats ; but the multiplicity of steps necessary to be interposed, before the tune of any note required can be found, in the keys with flats thus regulated, seems a sufficient reason for rejecting them.

What appears of still greater consequence is, that such a regulation leads off from all immediate connection with the tune of the open strings. For although these are seldom used alone in good performance ; yet having their tune to appeal to as directing our departure, and frequently also having occasion to use them as unison, or some other concord, to a stopped note, they become a great security when true to the key ; but when false, especially if the difference be small, they cannot fail to mislead. And it will presently appear, that the greatest masters have been misled by them to the extent of comma at least ; the effect of which, when examined by the experiments already proposed, will give an idea of the errors existing, and frequently occurring in the very best performances : shewing also
how

how far the ear will suffer itself to be imposed upon; nay, that it will seem to relish, and even to be delighted with musical performance, in spite of such and much greater blemishes, notwithstanding of its capacity to distinguish with the utmost precision.

Take a piece of brass wire; soften it in the fire, which will fit it to retain any shape into which it may be moulded; roll it round any thing of a cylindric form, about the thickness of the forefinger; and taking it off, draw it a little to length, and it will take a spiral form. Put it upon the first joint of the forefinger, and draw forward the end nearest the point of the finger. See Plate VIII. fig. 18.

Take a well-tuned fiddle, and, applying the hand in the ordinary way, gently put the end of the wire below any of the strings; but the higher ones give the more distinct trial. Then, according to any of the proposed experiments at the beginning, make trial by sliding the wire higher and lower upon the finger-board, the fin-

ger gently pressing down the string upon the wire as upon a fret, and attending accurately to the tune of the two strings sounding, till the ear is satisfied that the concord is perfect; perceiving that all beatings and wavings have ceased, and that the third tone produced by the two sounds, and first noticed by the celebrated *Tartini*, is heard pure and distinct. Then let an assistant mark the spot with a needle's point where the part of the wire acting as a fret crosses the stopped string, making a small puncture upon the finger-board. After the puncture is thus made, withdraw the wire from below the string, and try if the fiddle has kept its first tune without alteration. Then proceed after the like manner to perform the other part of the same experiment for tuning comma; and the distance betwixt the two punctures will appear to be very considerable. If, after repeated trials, (the distance between the nut and the bridge being carefully made the same as before), it shall be found that the punctures do always nearly,

ly,

ly, and often exactly, coincide with those made in the first trial; who can doubt of the exquisite discernment of which the ear is possessed? And when the difference of comma (which has hitherto been unattended to in practice) is thus exhibited both to the ear and eye; who can doubt of the great inaccuracy of our musical performances, or of the high improvements of which they are capable?

A doubt has been expressed of the constant coincidence of the punctures; because although, under very favourable circumstances, they will often successively coincide for a great number of trials, yet this cannot always happen. The minute inequalities upon the surfaces of the strings always more or less affect the tone with some degree of imperfection. Such strings as are now used are very subject to alteration, and never for a moment continue perfectly steady in the same degree of tension. The state of the air has a remarkable effect upon them, especially if the weather be moist; and it frequently happens, that some con-

derable time is spent in ascertaining the point of true tune. But above all, inequalities in the shape and thickness of the strings are unfavourable. These, and a thousand other circumstances which must occur in every trial, are more than sufficient to account for small variations that sometimes happen in the situation of the needle's point.

It may be recommended to the performer upon the violin to have a copy of the regulated scales lying before him when he goes to practise; and for some time at least, till he become well acquainted with them, he should, before entering upon the practice of any piece of music, frequently go through the tune of the scale which regulates its principal key, till he find he can readily recollect the pitch of every note belonging to it.

When he proceeds to practice, however laborious, yet if he desire to excel, he must not neglect to study every passage separately, and to repeat it a thousand times; sometimes stopping at one note, sometimes

times at another, to examine the tune and to correct errors.

Great attention must likewise be paid to the changes of key, and other circumstances afterwards to be explained, which often occur in the progress of a composition. And indeed these should be particularly marked by composers and writers of music: for whenever the key is changed, or any other circumstance occurs requiring an alteration of the pitch of tune, the manner of taking the tune must be changed also. The scale which regulates the tune of the new key, or which directs to the tune required by other circumstances, must be followed as a guide, till the composition return to the former pitch, or modulate into another key.

Let not the appearance of difficulty make the learner despair altogether of success. For a continued attention to the scales will enable the hand to attain great accuracy, though seldom answerable to the full demand of the ear, yet to such a degree

degree as will greatly improve the tune of the very best performer.

For, as it has been said, it is not to be hoped that ever the hand will be formed, even by the closest attention to these scales, so as steadily to strike the perfect tune contained in them. But it is a happy condition of humanity, that although it can very seldom reach even the limited degree of perfection we speak of; yet still it can be pleased, nay delighted, in proportion to the degree of approach it makes; otherwise we might sit down with hands across, and give up the pursuit.

That music, as hitherto practised, is not only delightful, but ravishing, none who have heard fine composition, executed in the masterly manner we now often hear it, and possessed of an ordinary capacity for enjoying it, will deny: but that even the best performances are exceedingly imperfect, can be proved beyond contradiction.

We have seen how palpably shocking the error of comma is, when deliberately attended to, in the experiments upon tune
already

already made. However this may pass in the hurry of performance, yet it most certainly has its influence, and renders many a passage that would otherwise be delightful, at least indifferent, if not disagreeable. For confirmation of this, we appeal to the judgment of an experienced ear, attending accurately to what passes in a concert of the best performers.

That the tune of the organ, harpsichord, and all instruments with fixed notes, as they are severally constructed, is false, is known and acknowledged; nay, were they actually tuned perfectly, agreeable to the plan of the ingenious Mr Smith, no two notes of the whole instrument would be in just tune, and very many of them would be false to the extent of comma at least. For it shall be shewn, that there is a natural divergency of pitch in almost every note, which, when the whole twenty-four keys are perfectly arranged, amounts to no less than double comma; and therefore, however this might be tempered by a medium pitch of tune, there

there would still remain errors equal to comma.

But it is plain, that the errors of the present instruments must be often much greater than comma, since no one pretends to be able practically to tune a system of tempered notes so as to divide the errors equally over the whole.

It may, however, seem more difficult to convict a violin-performer of such errors ; for it must be acknowledged, that the instrument is capable of perfect tune, as has been shewn. But the question is, Whether ever in fact perfect tune has been performed upon it? There is reason to think it has not ; and that the errors of the best performers are very frequently not less, but still greater than those found in fixed instruments.

Probably it will not be denied, that every violin-performer means to derive the pitch of his tune from the tune of the open strings in general ; else, why tune his fiddle to the pitch of other instruments

ments with which he is to perform in concert? or indeed why tune it at all?

It seems likewise probable, that in performing any piece of music in the natural key major C, he means to take the tune of the fourth string as fifth of the key, and that of the open third string as second of the key. If so, then the open second and open first strings are both out of tune to this key; and the error is comma. And if, in such circumstances, a performer ever admit the tune of these open strings, or their unisons, he is unquestionably out of tune by comma.

There is no disputing with a nimble-fingered performer, upon what happens during performance. We may say, that we feel his errors; and he will answer, that it is affectation to say so. The appeal then must be made to something more permanent than the fleeting perception of a note as it passes in the act of performance; and fortunately, or rather unfortunately, there is large store of errors in the compositions of the greatest masters.

masters. There shall only be given three examples; but these taken from the works of the most eminent musicians.

TARTINI'S SOLOS, *Opera 1ma, sonata 3za, motiva 2da, allegro*. Through the whole of this movement, it is plain, that the tune of the open first and second strings is frequently meant to be admitted; but we shall quote a few passages for all. Last crotchet of the second bar, Plate VIII. fig. 27.; first crotchet of the ninth bar, fig. 28.; sixth bar of the same, fig. 29. In the two first of these passages, we have the tune of the open first and second strings, necessarily admitted into the tune of the natural key major. For, in the second bar, while C is stopped upon the second string, E above it, cannot be taken in any pitch lower than the tune of the open first string; nor, in the ninth bar, can A be brought into consonance with G in any pitch lower than the open second string. In the sixth bar, although it is improbable that Tartini meant any thing else than that the tune of the third and fourth strings

strings open should be used in the two first crotchets ; yet the third puts it beyond all question. For it cannot be supposed that he there means to use the first finger upon the fourth string to raise the tune comma higher, the second finger for E upon the third string, and the third or fourth finger upon the second string for C ; which nevertheless must be done if he meant to execute these passages in true tune, consistent with the others. For it has been shewn, that if the key be so pitched, that the tune of the open third and fourth strings belongs to it, the tune of the open first and second strings is too sharp by comma ; and consequently, that if the key were pitched so as to render the open first and second strings in tune to it, the open third and fourth strings must then be false by the like quantity.

CORELLI'S SOLOS, *Opera 5ta, sonata 3za, motiva 2da, allegro.* Through the whole of this movement also, it is clear, that the tune of the open first and second strings is meant to be admitted ; especially beyond all dispute

pute in in the last bar, (fig. 30.), where the closing chord, which is surely meant to be the perfect harmony of the key-note, cannot be performed upon the violin without admitting the open tune of the first string.

I have none of Giardini's works at present, except six solos; where he has been so sparing of double notes, that there is little opportunity of getting examples. However, in the third movement of his second *sonata, andante, grazzioso*, bar 4th, (fig. 31.) it cannot be thought he meant otherwise than that the open tune of the first string should be admitted.

All these examples are taken from the key major natural; because, having explained the falsity of the tune of these open strings in that key, fewer words are required to point out the error. But from a careful comparison of these regulated Scales, with compositions in all the different keys, and in the works of all the composers I have hitherto had occasion to examine, similar errors are very frequently

ly

ly to be found: and therefore, supposing such compositions to be executed with the utmost accuracy upon the violin, they must notwithstanding be out of tune by comma. This will still more clearly appear in Part II.

But when it is considered how improbable it must be that any performer ever was able to execute, even to the degree of exactness meant in such compositions, it may be believed, that the errors of the very best violin-performers are still greater than those found in instruments with fixed notes of the present construction.

Since thus it appears probable, that true tune has never yet been heard in performance, the acquisition of a series of fixed notes, capable of producing it, must be very desirable; especially if it be considered, that there are almost innumerable degrees in approaching to it, perceptible by the ear; as the experiment mentioned pages 133, 134, 135, or even a trial with the bare finger, will shew: for the

K interval

interval of comma requires a very considerable alteration of the place of the finger upon the violin; and it will be found, that after an approach has been made towards true tune as near as may be, by an actual removal of the finger, still the effects of a small roll, or even a different degree of pressure, will become sensible to the ear. So delicate a matter it is to touch the instrument truly, and so little foundation has there been for the pretensions to merit on this point.

Our being pleased at all in such circumstances is probably owing to a secret effort of the mind, exerting itself to supply the defect, in an approach to what is really beautiful; and the nearer the approach, the less force being upon the imagination, the pleasure becomes proportionably greater. But the explanation of this matter belongs more properly to philosophy than to a treatise of this kind; only this observation seems necessary at present, in order to account, in some measure,

sure, not only why we are pleased, but why we are not greatly offended.

Independent of the truth of theory, upon the principles of which these scales are formed, their importance will clearly appear from the following considerations.

A performer upon the fiddle, having no limited pitch from which he is necessarily obliged to derive his tune, but only in general from the tune of the open strings, he may take the open second string as sixth, and the open first string as third, to the natural key major C: and it is neither more difficult nor unnatural to derive the other degrees of tune belonging to this key justly from these, than from the other open strings pointed out in the regulated scales. But should he form his hand in this manner, and afterwards join in concert with one who has practised according to the pitch in the scales; if each of them perform accurately in tune to his own pitch, they must constantly be out of tune to each other. For it will not surely be denied, that it is owing to a habit ac-

quired from practice, that a performer is enabled readily to strike what is commonly admitted as good tune; and if the habits of one performer disagree with those of another, admitting that each separately be able to perform in good tune, yet together they must jar: Against which disadvantage there can be no other security than one common rule; and it is presumed that these scales, so far as they have been carried, will be found unexceptionable guides to true practice.

But it cannot be supposed that the steadiest performer ever adhered so invariably to any particular mode of striking tune, as to risk an uniform disagreement with another in the manner before mentioned. The tune of the open strings probably leads and misleads universally, as opportunity serves best for touching or referring to them: And in concert, the whole being bound to a kind of medium by the imperfect tune of the harpsichord, the errors may rather be said to be negatively than positively felt; although they certainly

tainly exist in full extent, while some performers are following the tune of one string, and others that of a different one.

This may be illustrated from a solo performed on the violin, where the chords are struck very agreeably; yet it is presumed, that if the best performer stop short and make deliberate trial, he will be able to improve his tune very sensibly, almost in every note. This must shew, that although the defect did not amount to direct offence, nay that the degree of approach was highly pleasing; yet if imperfection had not marred it, the effect of the performance would have been greatly heightened. It must likewise shew, that such errors, although they leave us in possession of high musical entertainment, yet unquestionably they deaden and load it; giving reason to believe, that if they could be removed, our musical performances would be greatly improved.

The effect of this refined regulation of tune might be left to be judged of from experience, upon fair trial. But few great

performers will be found willing to acknowledge such defects in their practice as these scales infallibly discover; and, without bringing reason to our aid, the authority of great names might prevail upon others less acquainted with the subject to treat them with neglect. Therefore, to what has been already said, it may still be necessary to add, that a performer, who pretends to approach to perfect tune without the assistance of such a guide, is surely not aware of the difficulty of his undertaking; for it will soon be shewn, that it is no less than to affirm, that his hand is able to distinguish not less than forty-four different degrees of tune within the limits of octave. No doubt the ear can do this; but can we believe that the hand can approach to it in practice? Besides what has been demonstrated to be the practice of the greatest masters, it will soon appear, that many of these distinctions are so extremely minute as the ratio $\frac{3}{2} \frac{2}{3} \frac{8}{7} \frac{5}{6} \frac{5}{8}$; and many degrees of tune, which are represented in the common mode of writing music

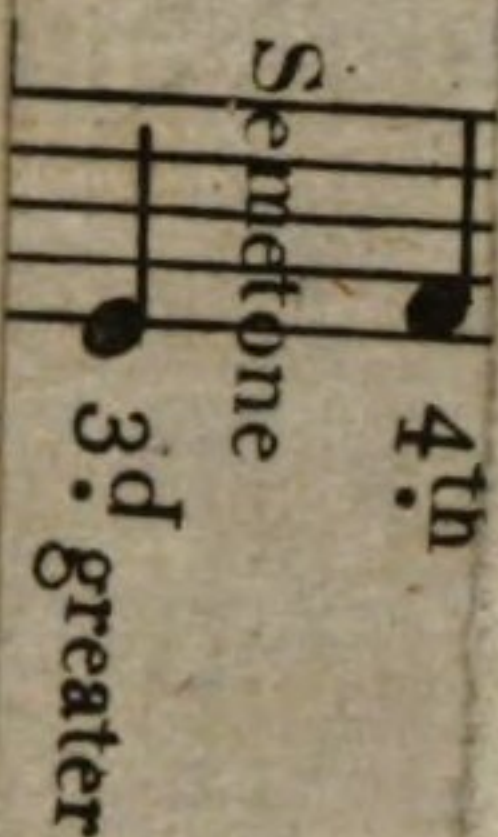
music by notes which mark no distinction of their pitch, are really different by no less than double comma, which is nearly equal to a fourth part of the greater tone: situated, too, under the great disadvantages of a very remote relation to the tune of any of the open strings, and very often directly under the influence of some one of them, whose tune being false, must certainly mislead.

The first step towards amendment is the conviction of error. This is the merit to which the preceding part of this Essay lays claim. Perhaps it might be added, that it in some measure points out the way to amendment. But besides the practical difficulty of stopping the fiddle accurately, as these scales direct, much still remains to be discovered of the principles of tune itself, and of the nature of the scale of music. This subject is reserved for a second part; in which it is proposed, first, to lay down a plan for the tune of the organ, after a method similar to that which has been followed in the investigation of the tune

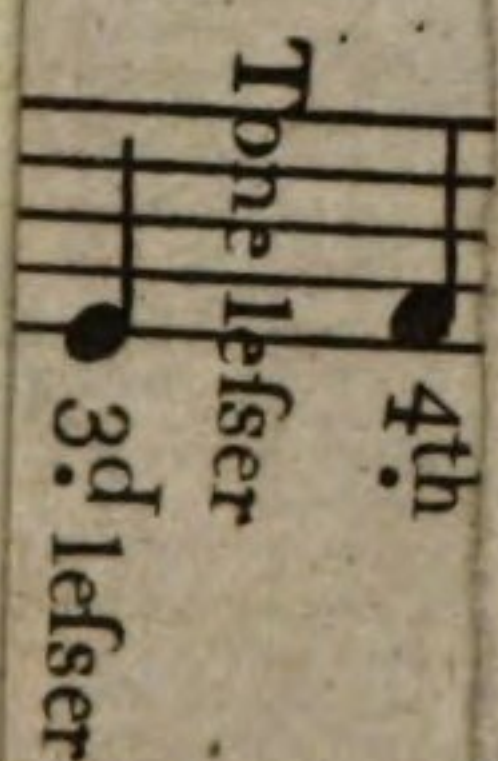
of the fiddle: and, secondly, to examine the relations of the several degrees of tune arising from it. This will lead to a solution of some problems concerning the scale of music which have baffled the learned in all ages, and to a discovery of some properties of tune which have hitherto lurked in concealment.

PART

N^o 1st S



N^o 2^d I



N^o 3^d G

le

1^o
Tome 1^{er}

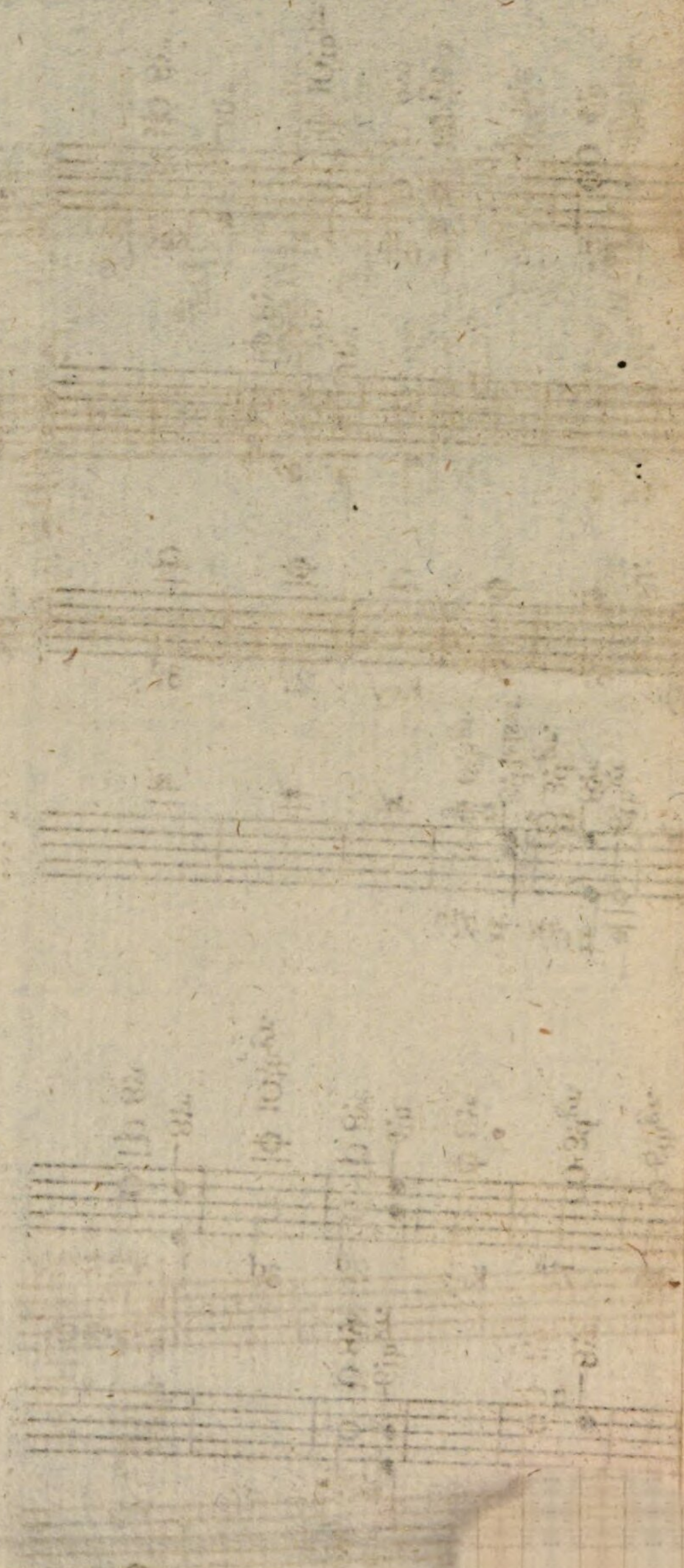
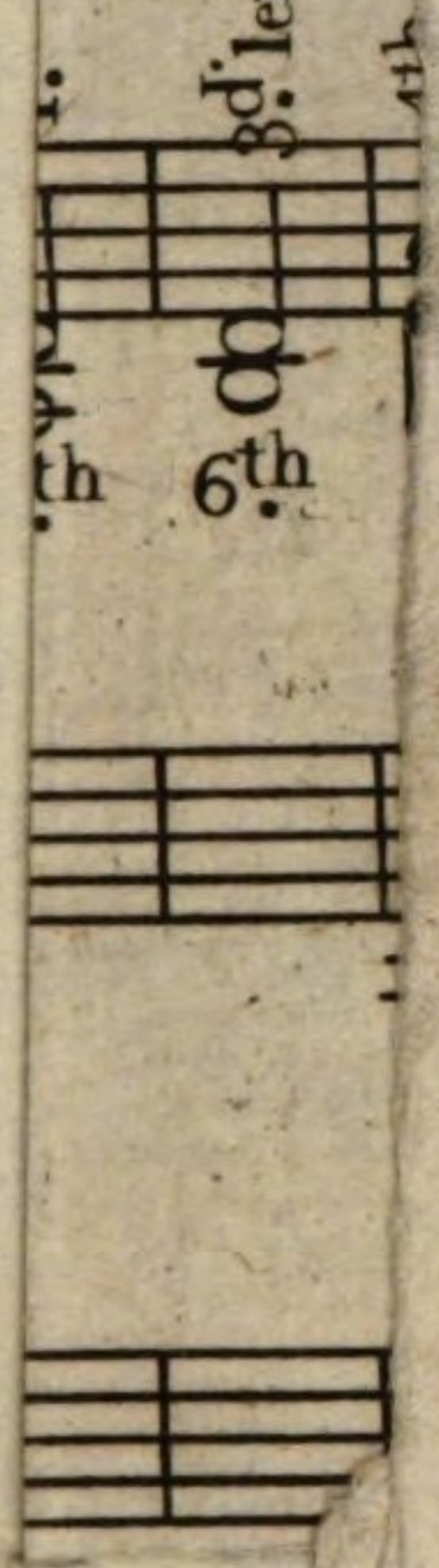
ulat

3^d 1^{er} 2^e
7^o

1^o

ted Scal

3d. lefser
6th



Sc

4th
5th

4th
5th

4th
5th

d Scale

6th finger
4th
4th
4th
3d
4th



Scales for the

8ve 2d 5th 6th gr

2d 3d 4d 5th 6th

8ve 2d 5th 6th

4th 5th 6th

Tuning

6th leiser

in. Keys w

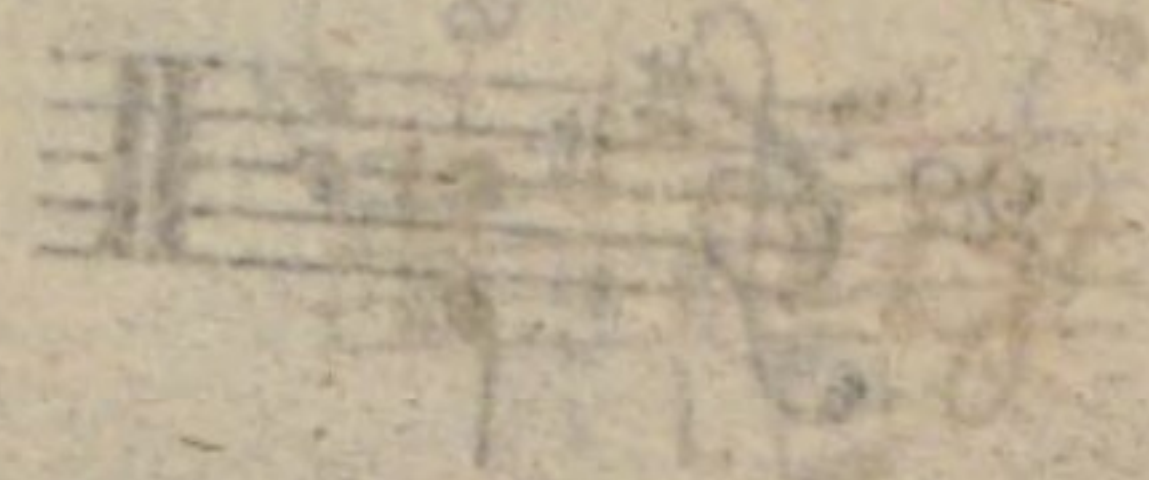




Handwritten text, possibly a title or instruction, oriented vertically.

Handwritten text, possibly a title or instruction, oriented vertically.

Handwritten text, possibly a title or instruction, oriented vertically.



Handwritten text, possibly a title or instruction, oriented vertically.

PART II.

Of the TUNE of the ORGAN.

CHAP. I.

Explanation of the Scales N° 32. to N° 43.

THE tune of such an instrument as the organ falls next under examination.

Altho' such an instrument may yield to the violin in some of the powers of expression; yet the organ, besides its advantages in other respects, will be found capable of being freed from the two great defects to which the ordinary fiddle, unreformed, must still be liable. In the first place, it can be freed from the irregularity in the connection

connection of the keys mentioned in the First Part: because, being under no necessity to attend to the tune of four fixed notes, (the open strings), which govern the whole tune of the fiddle; in tuning the organ, we have it in our power, after deriving a variety of notes from one fixed tone assumed as the ground of the whole, to fix all these several notes, and derive others from them. Secondly, it is not liable to the uncertainty of finding the true tune of any note in performance: because, in tuning the organ, every degree of tune, being deliberately adjusted, and subjected to a great variety of check-examinations, may be fixed, and stand ready for the performer.

It seems to be a matter of perfect indifference, in tuning the organ, with what key we begin. Perhaps it would be more uniform to prefer the keys with five flats; and from these to proceed regularly, by taking each succeeding key-note chord of fifth above the former key-note through the whole twelve signatures. In this case, a
flat,

flat, and also a grave mark, must be taken off from each succeeding signature in the progress towards the natural keys; and a sharp, and also an acute mark, must be added to each succeeding signature during the progress forward from the natural keys to the signature with six sharps.

But to follow the common method, of making the other keys arise from the natural scale, it seems better to take the departure from it, and to proceed as before, making the fifth of each preceding key major, key-note to the succeeding key major, and adding one sharp and one acute mark to each succeeding signature, till we arrive at the signature with six sharps; and from this signature returning to the natural scale, again proceed in the order, according to the rules given for forming the keys with flats, till the twelve signatures, containing in all twenty-four keys, be completed in the signature with five flats.

In order to trace the connection of tune with greater ease, it may be requisite to have a table of affinities, shewing the concordant

cordant relations in which each note stands to others in the diatonick scale for both modes. This is nothing more than setting down in a table, which may be easily traced by the eye, the several intervals from each note to another with which it stands in true concordant relation, neglecting all such intervals as are held to be false or discordant; because the system of tune must only be constructed by reference to the acknowledged concords, the ear not being supposed to be an adequate judge of the true pitch of discord: Although to this opinion I would not be understood to have subscribed.

TABLES

TABLES OF AFFINITIES.

TABLE for the MAJOR MODE.

Key-note	is chord of	3d greater 4th 5th 6th gr. octave	to the	3d greater 4th 5th 6th gr. octave	of the key, or chord of	6th lesser 5th 4th 3d lesser octave	} to its 8ve below
Second of the key		4th 6th gr.		5th 7th		5th 3d lesser	
Third of the key		3d greater 3d lesser 4th 5th		Key-note 5th 6th 7th		6th lesser 6th gr. 5th 4th	} to its 8ve above } to its 8ve below
Fourth of the key		4th 3d greater		Key-note 6th		5th 6th lesser	
Fifth of the key		5th 3d lesser 4th 3d greater		Key-note 3d 2d 7th		4th 6th gr. 5th 6th lesser	} to its 8ve above } to its 8ve below
Sixth of the key		6th gr. 4th 3d greater		Key-note 3d 4th		3d lesser 5th 6th lesser	
Seventh of the key		6th gr. 5th 3d greater		2d 3d 5th		3d lesser 4th lesser 6th lesser	} to its 8ve above

TABLE for the MINOR MODE.

Fourth of the key	must become chord of	3d greater 3d lesser 4th	to the	6th gr. 6th lesser Key-note	and must be chord of	6th lesser 6th gr. 5th	} to its 8ve below
Sixth lesser		6th lesser 3d lesser		Key-note 4th		3d greater 6th gr.	
Sixth greater		6th gr. 3d greater		Key-note 4th		3d lesser 6th lesser	} to its 8ve above
Seventh lesser		3d lesser 6th lesser		5th 2d		6th gr. 3d greater	
Seventh greater		6th gr. 3d greater		2d 5th		3d lesser 6th lesser	

These

These tables are not meant to be universal, but only to comprehend such concordant relations as there may be occasion to use in regulating the tune of the organ ; the first containing what is required for tuning the major mode, and the second such additions as are wanting for tuning the minor mode.

In the First Part of this Essay, the reader was referred to the Scales N^o 3. and 4. for the sake of fixing an idea of the situation and true quantities of the concordant intervals. After this, the Table of Affinities may be used, having these intervals ready summed up, to save the trouble of counting the degrees upon the scales, which still may be done in the case of doubt.

In these tables, the double relation of each note is marked ; that is, not only the relation of any note to any degree of the scale below it, but also to the same degree above it. For example: In the key natural C, if G be compared with the key-note below, the relation is chord of fifth ; but if the same G be compared with
the

the key-note above, the relation is chord of fourth. Hence the complement of the chord of fifth to octave is chord of fourth; and the complement of every chord to octave is also concord. Thus the chord of sixth greater, added to the chord of third lesser, make octave. The rest appear in the Table of Affinities: but a further account of this matter belongs properly to the more abstract theory; this much seems necessary for explaining the terms.

It must be observed, that, in constructing the scales for the organ, the single relations of the chords to each particular note are only marked, without adding the complements, except on the seconds and fourths of the keys; the concordant relations of these last being so few, that the complements may be admitted without crowding. Upon all the other notes, whose concordant relations are more numerous, the complements of the chords are left to be found by taking octaves.

In the tables, the second and fourth of
any

any key have not been admitted to stand as chord of third to each other; although very frequently they are found to stand together in composition in that relation. But unless either the second be flattened, or the fourth raised, or both altered, they cannot yield chord of third; because that interval, as it presently stands in the diatonick scale, is comma less than the chord of third. But of this more particularly afterwards; and in the mean time it is proper to proceed to give a specimen of the method of examining the scales for the tune of the organ.

In these scales, the marks in the signatures of the keys with flats are different from those for the fiddle; but this difference, as has been said, is owing to an irregularity admitted into the tune of the fiddle, which there is no occasion to adopt in that of the organ. See Scales N^o 32. to N^o 43.

Perhaps any further explanation of these scales may be thought superfluous; but

to

to leave any obscurity or defect in treating so difficult a subject seems unwarrantable.

In all the keys major, the tune of each key from the key-note is plainly the same as marked in the Table of Affinities; which being derived from the diatonick scale, may be compared with it in Scales N^o 3. and 4.: therefore each of these keys major must of itself be in true diatonick tune; and the connection with one another is also perfect. For, beginning with the key major with five flats, and proceeding from that key through the other keys with flats towards the natural key, and from this by the keys with one sharp, in order, to the keys with six sharps; the key-note of each succeeding key will be found to be pitched true chord of fifth to the key-note of the preceding key. All the notes of the preceding key are also true notes of the succeeding one; except the fourth of the preceding key, which will be found to be raised to the true pitch for the seventh of the succeeding one; a flat mark being removed, or a sharp mark

L added.

added. And the sixth of the preceding key will also be found to be raised comma, so as to become a true second to the succeeding key; a grave mark being removed, or an acute mark added. And this is strictly observed through the whole, according to Rule I. (page 48.) For this rule, as has already been observed, holds through the whole when this order of progress through the keys major is followed; and it is only the major mode that is now spoken of. The second rule will also hold through the whole in the order beginning with six sharps, and ending with five flats: therefore all the keys major are in true tune, and perfectly connected. And it shall still more particularly be shewn how this is effected, in comparing the natural key major C with the key major G with one sharp.

C being the key-note of the natural key major, its sixth, A, is tuned chord of sixth greater above; which, by the Scale N° 3. is composed of two tones greater, two
tones

tones leffer, and one femi-tone: and G of the fame key being tuned chord of fifth above the key-note C, the interval between C and G contains two tones greater, one tone leffer, and one femi-tone; which last fum being fubtracted from the former, leaves the tone leffer as the difference between G and A. But when G becomes the key-note of the key major with one fharp, the interval between the key-note and its fecond must be tone greater: therefore one of these two, G or A, must be removed to its due diftance from the other. But it would break the connection between the keys if the key-notes were made to difagree: therefore G must remain in its pitch, and A alone be altered.

This is effected by tuning A' chord of fifth above D. D being tone greater above C, the interval from C to this new A' is tone greater added to chord of fifth, which is equal to three tones greater, one tone leffer, and one femi-tone. But A, as it stood before tuned chord of fixth greater to C, made an interval of two tones great-

er, two tones leffer, and one femi-tone; which last sum is less than the former by the difference between the tone greater and the tone leffer: therefore this new A', tuned chord of fifth above D, is comma sharper than A, which was sixth to the key C; consequently it is a true second to the key major G with one sharp.

Again, F, the fourth of the natural key major C, is tone greater below G, the fifth of the same key. But when G becomes the key-note of the major mode with one sharp, it must have its seventh standing femi-tone below, in the same relation to it as did the seventh of the former key. There must therefore be a new note tuned for this purpose; and although it is named by the same letter F, it must have a sharp mark affixed to it, denoting that it is removed higher by the distance of limma major.

This *F must be tuned chord of sixth greater above A': because, by the Table of Affinities, the seventh of the key major is chord of sixth greater above its second.

cond. But, by the same Table, it may be tuned chord of fifth above the third of the key, which is B; or chord of third greater above the fifth, which is D; as appears marked on the Scale N^o 33.

It seems worthy of observation, that these two notes which are second and seventh of the new key, are both discords to the key-note; but they are tuned as concords to other notes, which are of a pitch common to both keys. From which defect in their relation to their proper key-note, and connection with the tune of the former key, they seem to bear a very characteristic medium relation to both: and as all the other notes are common to both keys, they may be said in some sense to fortify the connection; especially when it is probable, from what shall be said afterwards, that the second and seventh of every key major must become changeable, and sometimes take the pitch these notes held in the preceding key, in the order from flats to sharps.

This may suffice for shewing the con-

nection of all the keys major with one another in their order. For it is perfectly uniform through the whole, and may now be easily examined; always, however, taking particular care to take into the consideration of their relations the effects of the pitch of tune which the grave and acute marks indicate, as well as the sharp and flat.

The relation and dependence of the minor upon the major mode of the same signature having been fully explained in the First Part, it would be altogether superfluous to add more here. It need only be recollected, that the pitch of the notes is the same in both modes; excepting only the fourth of the minor, which is comma flatter than the second of the major; and also the sixth and seventh greater, which are occasionally used in the key minor. In the scales, therefore, for the tune of the organ, all the pitches of tune required for the minor mode being prepared in the tune of the major, excepting these three, the notes are simply put down by themselves

themselves in the staff of the minor mode, referring to the regulation of the note of the major directly over each for shewing their pitch. The other three notes, whose tune is different from all the notes of the key major over them, have their own particular regulation marked in the staff appropriated to the key minor.

The tune of the sixth and seventh lesser of the minor is shewn in these divisions of the major mode directly over the places where that of the sixth and seventh greater of the minor is marked: for it seemed needless to make a third staff for the tune of the organ, since inquiry is here only made into the tune of the instrument, without view to direct the practice, which it seemed proper to have an eye to in regulating the tune of the fiddle.

One specimen shall likewise be given of the formation of these three notes, which must render the examination of all the rest perfectly easy.

G, the fifth of the natural key major, is tuned chord of fifth above C the

L 4

key-

key-note; and D, the second, is again tuned from the same G chord of fourth below it: for when the chord of fourth is subtracted from the chord of fifth, the remaining interval is tone greater: therefore D, thus tuned, is a true second to the key C, being tone greater above it. But A is tuned chord of sixth greater above C; and if D' be tuned chord of fifth downwards from A, this last D' shall be comma flatter than D: for the chord of fifth being subtracted from the chord of sixth greater, the remaining interval between C and D' is tone lesser. But the complement of the chord of fifth to octave is chord of fourth: therefore if another D' be tuned chord of fourth above A, it shall be octave to D' tuned downwards from the same A as before; and consequently D', so tuned, is the true fourth of the key minor A natural.

The fourth of the key minor with one sharp, has the negative mark, to shew that it is comma flatter than A', the second of the

the key major G with one sharp, and that it is of the same pitch with A, the sixth of the key major C; and so of the rest: therefore this A° need not be tuned anew; and referring to the tune of A in the natural key major C, the note is only marked in its place, without any regulation upon it. And the tune of the fourth of each succeeding key minor is always referred to that of the sixth of the major of the preceding signature, in proceeding towards the signature of six sharps.

But, in proceeding by the order from the natural signature towards the signature with five flats, the operations being reversed, the pitch of the fourth of each key minor does not arise in the major mode till the sixth of the succeeding key major appear: therefore it seems best to express its proper regulation upon the note, there being nothing already prepared to refer to. The regulation of the same degree of tune is repeated in the succeeding key major; because it may be best to keep the regulation of the keys major always full, having

ving all along reasoned from the major to the minor mode; which last has only been considered as dependent upon the former.

The regulation of the sixth greater is exceedingly obvious. A, the sixth of the natural key major, being the key-note of the minor mode of the same signature, tune $\ast F^{\flat}$ chord of sixth greater above it, and it is the sharp sixth of the key; but a grave mark is put upon it, for the reason given in pages 68, 69.

It need only be noticed here, that this $\ast F^{\flat}$ is also tuned chord of third greater above $D^{\flat}$; while $\ast F$, the seventh of the key major G with one sharp, which is truly limma major acuter than F, is tuned chord of third greater above D, and therefore must be comma acuter.

The seventh greater of every key is chord of third greater above its fifth. The third of the key major is always the fifth of the key minor of the same signature: therefore $\ast G^{\flat}$, the seventh greater of the key minor A, is tuned chord of third greater

greater above E, the fifth of the same key. This seventh greater, too, has a grave mark, for the reason already given. It is tuned chord of third greater above E, while *G is tuned chord of third greater above E'.

It may also be noticed, that the key-note of the key minor A natural having no acute mark, and the key-note of the key major A' with three sharps having the acute mark, the sixth and seventh greater of the former must be comma flatter than the sixth and seventh greater of the latter.

In these accounts of the regulation of tune, there has only been noticed one particular chord as regulating the note spoken of at the time, although several more are marked in the scales. This is done to avoid embarrassing the subject with too many words. The whole seems so exceedingly obvious, that we are rather apprehensive of having exceeded the due bounds of explanation.

C H A P.

C H A P. II.

Explanation of the scale for tuning the organ ; and the number of the degrees of tune required in each octave.

TO shew the system of tune contained in the Scales N° 32. to N° 43. in different lights, and to subject it to examination in various ways ; likewise to furnish a method for tuning the organ by chords of fifth chiefly, the chords generally used in tuning such instruments ; a Scale, N° 44. is drawn, called the *tuning-scale*.

In this tuning-scale, every pitch comprehended in the former scales is inserted, and to each of these the concords which connect it with the pitch-note are marked in a different way. But, in tuning the instrument constructed according to the proposed plan, there is this material difference to be observed from the method used in tuning the common organ, that all the chords of fifth, and also every other
chord

chord in the instrument, must be made truly perfect ; whereas the nature of the present defective instruments cannot admit any interval to be made perfectly accurate, but all of them must be tempered, or, in other words, put a little out of tune.

In each division of the tuning-scale, distinguished by a double-bar mark, after the crotchets which lead to the tune of the first minim from the pitch-note, the succeeding intervals are all chords of fifth, as marked by the figures over the notes to the end of the double bar.

To explain the nature of this tuning-scale, let it be understood, that C being pitched, the interval between it and D the second must be tone greater ; and how this tone greater is found by first tuning G chord of fifth above C, and from that fifth, taking a chord of fourth, downwards to D, has been shewn already, page 168. The tune of E, F, G, and A, stand directly as chords of third greater, fourth, fifth, and sixth greater, respectively, as marked over them, to the pitch-note
C.

C. And the seventh greater of any key, being chord of fifth above the third greater of the same, B, tuned as in the scale, is the seventh of the key major natural. If it be considered, that, in the progress through the keys major with sharps in order, the fifth of each preceding key was assumed as key-note to the succeeding key, it is plain, that all the other notes of each succeeding key must be made chord of fifth to the corresponding notes of the preceding one. Thus, *F, the seventh of the key major G with one sharp, is chord of fifth to B, the seventh of the key major natural C; and proceeding to make *C chord of fifth to F, and so forth to *E', the seventh of the key major F' with six sharps, all the sevenths of the keys major with sharps shall be in true tune for their respective keys; originating from the pitch-note at the beginning, and ending with *E', the last note of the first division of the tuning-scale.

In this tuning of the sevenths in sharps, and also through all the following divisions

sions of the tuning-scale, very often the chord of octave is introduced; but this alters not the relation of the chords of fifth, but only reduces the marking of the tune to the bounds of the staff, which otherwise would fly off above, or sink too much below it.

Farther, F, the fourth of the key major C, for the reasons already given, being the key-note of the key major with one flat, $\flat B$ is the fourth of that key. In tuning the keys major with flats, in their order from the natural key major, the method of proceeding being reversed, the corresponding notes of each succeeding key must become chord of fifth to those of the preceding one, counting downwards. Thus $\flat B$, being the fourth of the key major F with one flat, $\flat E$, the fourth of the key major $\flat B$ with two flats, must be tuned chord of fifth below the said $\flat B$; and so on through all the fourths of the keys major with flats. Each fourth in order is to be tuned chord of fifth below the former, reducing the
tune

tune to the compass of the staff, by introducing an octave when requisite, till we arrive at $\flat G'$, at the end of the second division. All the fourths of the keys major with flats shall thus be in tune.

The first note that arises with an acute mark in the scales for the tune of the organ is A' , the second of the key major G with one sharp; and it is tuned, as has been already explained, chord of fifth above D ; which D was tuned chord of fourth below G , the fifth of the pitch-note. Thus, therefore, all the seconds of the major keys with sharps may be derived from the pitch-note; each succeeding second in order through these keys being made chord of fifth above the preceding one: and this operation is continued until all these seconds are tuned, the last being $\ast G'$ standing at the end of the third division of the tuning-scale.

The first grave note that arises in the progress of the keys major is D' (see the Scale N^o 39.), being the sixth of the key major F with one flat. This also being
derived

derived from the pitch-note, after the manner already explained, and marked in the tuning-scale in the beginning of the fourth division; the tune of all the sixths of the keys major with flats may be formed as chords of fifth downwards in their order of succession, as directed by the tuning-scale, to near the end of the fourth division at $\flat B$; which is the sixth of the key major $\flat D$ with five flats: to which $\flat E$ is added, not as the sixth of any key major, but as the fourth of the key minor with five flats. For it has been shewn, that, in the order of the keys with flats, the fourth of each preceding key minor is of the same pitch of tune with the sixth of the succeeding key major; and the tune of the sixths of the succeeding major keys have hitherto supplied also the tune of the fourths of the preceding keys minor. But there being now no succeeding key major after the key minor with five flats, this $\flat E$ must be added to the scale, to shew its own tune as fourth of the key minor with five flats.

M

Next,

Next, let $\flat B'$, as it stands sixth greater to the key minor D' with one flat, be tuned, (see Scale N° 42.); and from this proceed to tune the sixth greater of the key minor G' with two flats, viz. $\flat E'$, as chord of fifth below the said $\flat B'$; and so go forward through the sharp sixths of the minor keys with flats in order, to the end of the fifth division of the tuning-scale at $\flat G''$. And in the last place, returning to the same $\flat B'$, proceed again by chords of fifths taken upwards through the sharp sixths of the minor keys natural and with sharps, in order, as in the sixth division of the tuning-scale to the end. Thus the instrument shall contain every degree of tune requisite to afford true diatonick music in all the twenty-four keys.

One reason why we return to the tune of $\flat B'$ to begin the last division of the tuning-scale is, that if the tuning of these sixths greater of the minor keys had begun at the signature of six sharps, or of five flats, it would have required a great many preliminary steps to be taken before the
the

the tune of the first fixth greater of either of these keys minor could have been derived from the pitch-note. Add to this, the vast train of fifths in succession to be taken before we could pass thro' the whole, the last always depending upon the truth of all the former, the risk would be much increased: therefore it seemed better to take a departure near the middle, pursuing the operation by one course thro' the flats; and, returning again to the same note, begin anew, and proceed through the sharps.

It has been said, that if an instrument were tuned with all the tones directed to be found in the tuning-scale, it would contain every degree of tune requisite to afford true diatonick music; because, upon examination, it will be found, that the tuning-scale contains all the degrees of tune comprehended in the scales called the *tune of the organ*, where all the twenty-four keys of music are regulated by true diatonick intervals. For beginning with the Scale N° 32. and taking down every

M 2

degree

degree of tune contained in it belonging to the keys major and minor in naturals, and from these proceeding through the whole twelve signatures, taking down only afterward, from each, such new degrees of tune as arise; when the whole is thus drawn out, it will be found, that the number of degrees, and their pitches of tune, are exactly the same with those contained in the tuning-scale: See the Scale N° 45. where the first double bar contains all the degrees of tune belonging to the Scale N° 32.; a single-bar mark separating the degrees belonging to the major mode, from those additional peculiar to the minor. The second double bar has those additional degrees required by the Scale N° 33. for the signature of one sharp, viz. *F as the seventh, and A' as the second, of the major; and for the minor, *C` as the sixth greater, and \*D` as the seventh greater to it. The fourth of this key minor being of the same pitch with the sixth of the key major natural, which is already taken down, must not here be repeated. Neither

ther must *G', the sixth greater of the key minor with two sharps, be repeated in the next double bar for that signature; because it is of the same pitch with *G', the seventh greater of the key minor natural: And so of all the rest of the fourths and sixths greater of the other keys in succession through the progress of the keys with sharps. In taking down the tune peculiar to the signature with one flat, D', the sixth of the key major, is likewise omitted, being of the same pitch with D', the fourth of the key minor natural: and so of the rest in proceeding through the signatures with flats; where the omissions are uniform, and the principle so plain, that there seems no need of further explanation.

The degrees of tune contained in this tuning-scale being numbered, exclusive of the repetition of $\sharp B$, which appears once in the first bar of the fifth division, and again in the first bar of the sixth division, are in all forty-four degrees of tune. And thus, instead of twelve degrees of tune in the common computation of the octave,

there must be no less than forty-four furnished for putting an instrument in diatonic tune; or if both extremes of the octave be included, instead of thirteen, there must be no less than forty-five. Although it probably will seem amazing to such as are versant in the subject, that this should be accomplished by so small a number of degrees, there is no doubt mere performers will be alarmed because it is so great. Indeed, if no other method could be devised than furnishing a finger-key to each tone of the instrument, we might give ourselves up to despair, notwithstanding the assertion of those violin-performers who, pretending to draw true tune from that instrument, really undertake a task of much greater difficulty. For they must not only take all these precise given intervals, varying according to the change of the keys, but also find them in an immense variety of proportions; for, in every different situation of the hand upon the finger-board, the proportional distance of the stop alters.

C H A P. III.

Of the Table collecting and estimating the several degrees of tune; and a further view of the elements of music.

IT seems proper next to collect the different degrees of tune which belong to each finger-key, and to arrange them in the order of their pitch. For, upon looking into the tuning-scale N° 44. or into the scales for the tune of the organ, N° 32. to 43. it will be found, that several degrees of tune must be assigned to each finger-key, as they appear placed in the following Table.

M 4

TABLE

TABLE collecting the Degrees of Tune
belonging to each Finger-key.

The finger-key representing the notes called	[	*B or C	]	must represent and produce	[	C, C', *B ^o ,	]
						*C', *C, *C', bD',	
						D, D', bD'', *C ^o ,	
						*D, *D', bE, bE',	
						E', E, E',	
						F, F', *E', *E ^o ,	
						*F', *F, *F', bG',	
						G, G', bG'', *F ^o ,	
						*G', *G, *G', bA,	
						A', A, bA',	
	[	*E or F	]		[	*A', *A ^o , bB, bB',	]
						B', B, bB',	
	[	bD or *C	]		[		]
	[	*C or D	]		[		]
	[	bE or *D	]		[		]
	[	E	]		[		]
	[	*F or G	]		[		]
	[	bA or *G	]		[		]
	[	A	]		[		]
	[	bB or *A	]		[		]
	[	B	]		[		]

The above table shews, that never less than three, but oftener four, degrees of tune belong to one finger-key: What are their differences, and consequently how great the errors of the present instruments, which afford only one note indiscriminately for the whole, shall be presently shewn.

Although every degree of tune requisite
to

to produce true diatonick music be now found, we are still ignorant of many of their relative degrees of pitch.

For example: Although it be known that C is comma acuter than C^ˆ, yet still we are ignorant whether *B[°], which belongs to the same finger-key, is sharper or flatter than either of them. And as the method contrived for computing this is uncommon, the operation by which the difference of these degrees of tune belonging to the finger-key C natural is found, shall be set down as an example, which will point out the way to find the rest. It will likewise shew how the degrees of tune contained in the tuning-scale N[°] 44. may be compared with the Scales N[°] 32. to N[°] 43. to prove, that the tune of the organ, prepared to give the twelve signatures, containing twenty-four keys major and minor, in true diatonick relation in all its degrees, is comprehended in the tuning-scale; and that, exclusive of the repetition of the pitch-note in octave, forty-four degrees of tune are required, and no more.

For

For a reason which shall be afterwards assigned, in the following operation, we must not calculate from the pitch-note to the others belonging to the same finger-key directly; but rather from the pitch-note to its octave, and to the octaves of the others.

The interval between C and its octave is three tones greater, two tones lesser, and two semi-tones; and turning to the tuning-scale N° 44, *B° is found tuned in the last division of that scale. In the beginning of that division,

G. L. S.

The first step taken is from C to F, marked above, chord of fourth, which by the Scale N° 3. contains

1 1 1

The second step from F to D' is chord of sixth greater,

2 2 1

Therefore the interval between C and the octave of D' is

3 3 2

The third step taken downwards must be subtracted, being that from D' to ♯B', marked above, third lesser,

1 0 1

The remainder, being the interval between C and ♯B', is

2 3 1

Brought

G. L. S.

Brought over, Interval between C and $\flat B'$, 2 3 1
 Add the fourth step, $\flat B'$ to $\times F'$, chord of
 fifth, - - - 2 1 1

The interval between C and the octave of
 $\times F'$ contains - - - 4 4 2

Subtract an octave, to free the calculation
 from large terms - - - 3 2 2

C is to $\times F'$ - - - 1 2 0

Add the fifth step from $\times F'$ to $\times C'$, chord
 of fifth, - - - 2 1 1

C is to the octave of $\times C'$ - - - 3 3 1

Add the sixth step from $\times C'$ to $\times G'$ chord
 of fifth, - - - 2 1 1

C to the octave of $\times G'$ is - - - 5 4 2

Subtract an octave - - - 3 2 2

C is to $\times G'$ - - - 2 2 0

Add the seventh step from $\times G'$ to $\times D'$,
 chord of fifth, - - - 2 1 1

C is to the octave of $\times D'$ - - - 4 3 1

Add the eighth step from $\times D'$ to $\times A^\circ$,
 chord of fifth - - - 2 1 1

C is to the octave of $\times A^\circ$ - - - 6 4 2

Subtract an octave - - - 3 2 2

C to $\times A^\circ$ is - - - 3 2 0

Add

	G.	L.	S.
Brought over, C to $\ast A^\circ$ is -	3	2	0
Add the ninth step from $\ast A^\circ$ to $\ast E^\circ$, chord of fifth, - - -	2	1	1
C to the octave of $\ast E^\circ$ is -	5	3	1
Subtract an octave -	3	2	2
C to $\ast E^\circ$ is - - -	2	1	-1
Add the tenth step from $\ast E^\circ$ to $\ast B^\circ$, chord of fifth - - -	2	1	1
C to the octave of $\ast B^\circ$ is -	4	2	0

In subtracting the last octave, it became necessary to use the sign (—) minus; because otherwise two semi-tones could not be subtracted from one. The semi-tone which has this sign prefixed means, that there is a semi-tone wanting in the sum: and when the next step which has a semi-tone belonging to it falls to be added, they destroy each other, and their sum is nothing.

Thus it appears, that C is to the octave of $\ast B^\circ$ an interval of four tones greater and two tones lesser. And because C is comma flatter than C the pitch-note, which
comma

comma is the difference between tone greater and tone lesser; if from the sum of the interval between C and its octave a tone greater shall be taken, and a tone lesser put in its place, it will give the sum of the interval between C and the octave of C', that is, two tones greater, three tones lesser, and two semi-tones; and these three pitches of tune will stand thus:

	G.	L.	S.
The octave of C, the pitch-note,	3	2	2
———— of *B° to the same			
pitch-note, —	4	2	0
———— of C' to the same,	2	3	2

	G.	L.	S.		G.	L.	S.
Thus the octave of C to C is	3	2	2	of *B° to C is	4	2	0
From each subtract	3	2	0	—————	3	2	0
	—				—		
Remains	0	0	2	Remains	1	0	0

Hence, after an equal subtraction is made from the interval of C to its octave, and from the interval of C to the octave of *B°; the remainder in the former case is two semi-tones; in the latter, one tone greater. And it is plain, that whichever of these two remainders is greatest, the

the degree of tune of which it is the remainder, must be the most acute.

The ratio which represents the interval called *semi-tone* is $15 : 16$; and that ratio added to itself gives the ratio $225 : 256$, which is the sum of two *semi-tones*. The ratio of tone greater is as 8 to 9; which, subtracted from the former, leaves the remaining ratio of $2025 : 2048$: therefore the interval which is the sum of two *semi-tones*, exceeds the interval of tone greater by this last ratio; and consequently C is acuter than $\ast B^\circ$.

In the same way, the interval of two tones greater, compared with the interval of one tone lesser added to two *semi-tones*, is computed: the first of which is the remainder of the sum of the octave of $\ast B^\circ$ to C the pitch-note; and the other is the remainder of the sum of the interval of the octave of C, also to C the pitch-note, after an equal subtraction has been made from both. And hence it is found, that the interval of two tones greater exceeds the interval of one tone lesser added to two *semi-tones* by the ratio $32,805 : 32,768$; and

and consequently, that B° is acuter than $\text{C}^\flat$ by that ratio. This may be proved by adding the ratio $2025 : 2048$ to the ratio $32,768 : 32,805$, and their sum will be found equal to the ratio $80 : 81$, which is comma, already known to be the difference of C and $\text{C}^\flat$.

The reason for the marks of the degree of tune assigned to the sixth greater of the minor mode in four flats may not perhaps seem very obvious, (see the Scale $\text{N}^\circ 42$.) It shall therefore be likewise explained by the above method of computation; hoping that this, with the former, may suffice as examples to direct to the manner of examining the propriety of the marks by which any other of the degrees of tune are distinguished.

$\text{D}^\flat$, the pitch of which is now under examination, is regulated as chord of sixth greater above, or as chord of third lesser below $\text{F}^\flat$; but F is the fourth of the natural key major C ; and therefore the interval between C and F is one tone greater, one tone lesser, and one semi-tone.

But

But F' is comma flatter than F ; therefore the interval between C and F' is two tones lesser, and one semi-tone, $\overset{G.}{0} \overset{L.}{2} \overset{S.}{1}$: add to this the chord of sixth greater, $\overset{G.}{2} \overset{L.}{2} \overset{S.}{1}$, the sum is $\overset{G.}{2} \overset{L.}{4} \overset{S.}{2}$, being the quantity contained in the interval between C and the octave of $\sharp D''$: from which sum, could an octave be directly subtracted in diatonick elements, the remainder would be the interval between C and $\sharp D''$. But as this is impossible, the remainder must be found, after making the greatest possible equal subtraction in elements from the sum of the interval of the octave to C , and from the sum of the interval of the octave to $\sharp D''$. Thus

	G. L. S.				G. L. S.		
Cisto the octave of $\sharp D''$	2	4	2	and Cisto its own octave	3	2	2
Subtract from each	2	2	2		2	2	2
Remains	0	2	0	Remains	1	0	0

Now, to gain a complete idea of the interval between C and $\sharp D''$, it is necessary to suppose a tone greater to be subtracted from two tones lesser; and it is plain the remainder would be, one tone lesser minus
comma

comma: therefore this last quantity is the true interval between C and $\flat\flat D$. But D without the grave mark is tone greater to C: therefore $\flat\flat D$ is double comma flatter than D; and consequently it is justly signed.

But although it be clear, that $\flat\flat D$ ought to be thus marked when written in any staff of music-lines, upon the beginning of which there happens not to be a grave mark standing upon the place of D; yet the strict propriety of adding the double grave mark may be doubted when the signature already contains one of these grave marks. In this case, perhaps, it ought only to have one single grave mark as an addition to the signature: But we follow the method often used for distinguishing the double sharps, and think it less liable to mistake.

The following Table of Comparative Degrees is calculated by the above method.

N TABLE

TABLE shewing the Comparative Degrees of Pitch of Tones belonging to each Finger-key of the Organ.

Finger-keys.	Notes.	Distances in diatonick degrees from the pitch-note.			Ratio in numbers.	Difference in diatonick degrees.					
						G	L.	S.	G.	L.	S.
*B or C	C	3	2	2	$\frac{2048}{32768}$	0	0	2			
	*B ^o	4	2	0	$\frac{32805}{32768}$	1	0	0	2	0	0
	C'	2	3	2	$\frac{32768}{2048}$				0	1	2
bD or *C	*C'	5	1	1	$\frac{81}{80}$	1	0	0			
	*C	4	2	1	$\frac{32805}{32768}$	0	1	0	2	0	0
	bD'	2	3	3	$\frac{2048}{2025}$	0	0	2	0	1	2
	*C'	3	3	1		1	0	0			
*C or D	D	4	2	2	$\frac{2048}{2025}$	0	0	2			
	*C ^o	5	2	0	$\frac{32805}{32768}$	1	0	0	2	0	0
	D'	3	3	2	$\frac{81}{80}$	1	0	0	0	1	2
	bD''	2	4	2		0	1	0			
bE or *D	*D	5	2	1	$\frac{32805}{32768}$	2	0	0			
	bE	3	3	3	$\frac{2048}{2025}$	0	1	2	0	0	2
	*D'	4	3	1	$\frac{32805}{32768}$	2	0	0	0	1	0
	bE'	2	4	3		0	1	2			
E	E'	5	2	2	$\frac{81}{80}$	1	0	0			
	E	4	3	2	$\frac{81}{80}$	0	1	0	1	0	0
	bE'	3	4	2					0	1	0
*E or F	*E'	6	2	1	$\frac{32805}{32768}$	2	0	0			
	F	4	3	3	$\frac{2048}{2025}$	0	1	2	0	0	2
	*E ^o	5	3	1	$\frac{32805}{32768}$	2	0	0	1	0	0
	F'	3	4	3		0	1	2			
bG or *F	*F'	6	2	2	$\frac{81}{80}$	1	0	0			
	*F	5	3	2	$\frac{2305}{32768}$	0	1	0	2	0	0
	bG'	3	4	4	$\frac{2048}{2025}$	0	0	2	0	1	2
	*F'	4	4	2		1	0	0			
*F or G	G	5	3	3	$\frac{2048}{3025}$	0	0	2			
	*F ^o	6	3	1	$\frac{32805}{32768}$	1	0	0	2	0	0
	G'	4	4	3	$\frac{81}{80}$	1	0	0	0	1	2
	bG''	3	5	3		0	1	0			
bA or *G	*G'	4	0	0	$\frac{81}{80}$	1	0	0			
	*G	3	1	0	$\frac{32805}{32768}$	0	1	0	2	0	0
	bA	1	2	2	$\frac{2048}{2025}$	0	0	2	0	1	2
	*G'	2	2	0		1	0	0			
A	A'	3	1	1	$\frac{81}{80}$	1	0	0			
	A	3	2	1	$\frac{81}{80}$	0	1	0	1	0	0
	bA'	1	3	1					0	1	0
bB or *A	*A'	4	1	0	$\frac{32805}{32768}$	2	0	0			
	bB	2	2	2	$\frac{2048}{2025}$	0	1	2	0	0	2
	*A ^o	3	2	0	$\frac{32805}{32768}$	2	0	0	1	0	0
	bB'	1	3	2		0	1	2			
B	B'	4	1	1	$\frac{81}{80}$	1	0	0			
	B	3	2	1	$\frac{81}{80}$	0	1	0	1	0	0
	bB'	2	3	1	$\frac{81}{80}$				0	1	0

The first column shews the letters and signs by which the finger-keys of a harp-fichord or organ are presently named. The second shews the degrees of tune as they ought to be represented by letters and signs: those assigned to each finger-key being bound together by hooks. The fourth shews the sum of the elements contained between the pitch-note C and each of the other degrees of tune. The fifth shews the ratios in numbers between each two contiguous degrees of tune belonging to the same finger-key. And the sixth and seventh shew the differences in elements, after the greatest possible equal subtraction has been made from every two terms, as in the above operation.

But observe, that as the middle tones stand in different degrees of relation to those above and below, the difference of the first and second tone in every group is put in the sixth column; the difference of the second and third is put in the seventh; and of the third and fourth, again, is put in the sixth.

N 2

Before

Before this table is considered, it is proper likewise to observe, that, to afford room for marking the differences of the degrees of tune represented by each finger-key in positive numbers of elements, it is necessary for some time, instead of their immediate relation to the pitch-note C, to assume their respective octaves; till, by ascending from C, the computation shall arrive at a sufficient distance to afford terms for calculating their differences, without the necessity of using the negative sign in marking the sums.

To explain this, let it be considered, that C, the pitch-note, (as it has been shewn in the above calculation), is the acuteest of all the degrees of tune belonging to that finger-key. And if the computation had not been made by the interval between that pitch-note and the octaves of the other tones belonging to the same finger-key, the intervals between it and the other degrees of tune could not have been expressed by any other means than

than by negative signs, because they are all flatter.

It therefore becomes necessary to take the interval which the pitch-note makes with its own octave, and with the octaves of the other notes; and by this means we find terms to express the differences in elements. This must be continued till we reach the finger-key $\sharp G$. For $\sharp F^\circ$, which is one of the tones belonging to the finger-key G, makes an interval with C, the sum of which is $\begin{smallmatrix} G. & L. & S. \\ 3 & +1 & -1 \end{smallmatrix}$. This sum cannot be expressed without the negative sign: but if an octave be added, there is no occasion, and it stands as in the Table, $\begin{smallmatrix} G. & L. & S. \\ 6 & : 3 & : 1 \end{smallmatrix}$. Afterwards it becomes unnecessary to continue to add the octave, being now arrived at a sufficient distance from the pitch-note to afford terms to calculate by, and to shew their simple intervals to C.

The reader need not be surpris'd when, in the Table of comparative degrees, sometimes a letter, which stands naturally next below another, after it has received a sharp mark, will stand higher than that

other, after that other has received a flat mark. An instance of this may be found in the degrees of tune belonging to the finger-key for $\flat A$ or $\sharp G$. There $\sharp G$ stands higher than $\flat A$. The interval between G and A , in their original pitch, as fifth and sixth of the natural key C , is tone lesser. But $\flat A$, by the flat mark annexed, is reduced limma major lower than the original pitch of A ; and G , by the sharp mark, is equally raised. And, upon trial, it will be found, that the sum of two limmas major added is a ratio of $16384:18225$; from which subtract a tone lesser $9:10$, (the original interval between G and A), and the remainder is a ratio of $32768:32805$. The sum of two limmas major, therefore, exceeds the tone lesser by the last mentioned ratio; and consequently the two letters thus signed must change their situation in the rank of pitch. But, in other like circumstances, where the rank of the letters continues as they originally stood, it will be found, that their natural interval was tone greater; and by calculation it will

will be found, that the sum of two limmas major is not equal to the tone greater: therefore the letters must still keep their original rank.

Thus the degrees of tune requisite to complete a system of notes for twenty-four keys, tuned by the true intervals of the diatonick scale, are discovered. And if it shall appear, that these degrees serve not only for this purpose, but also furnish the means of correcting what have been held the internal defects of the scale, perhaps the ratios which these degrees of tune may discover may likewise be intitled *elements of tune*. They are as follows:

ELEMENTS of TUNE.

1 st , Tone greater, a ratio of	8 to 9
2 ^d , Tone lesser, a ratio of	9 to 10
3 ^d , Elementary semi-tone, a ratio of	- 15 to 16
4 th , Limma major, being the difference between tone greater and semi-tone, a ratio of	128 to 135
5 th , Limma minor, be-	
N 4	ing

ing the difference between
tone lesser and semi-tone,
a ratio of

24 to 25

6th, *Comma*, a ratio of

80 to 81

7th, *Diesis major*, being
the difference between the
sum of two semi-tones and
tone greater, a ratio of

2025 to 2048

8th, *Diesis minor*, being
the difference between the
sum of two tones greater,
and the sum of one tone
lesser added to two semi-
tones; or the difference
between one tone lesser,
and the sum of two lim-
mas major, a ratio of

32768 to 32805

The terms *limma* and *diesis* are retained,
as being used by writers upon music, altho'
hitherto without accuracy.

It may be proper, however, here to take
notice, that although these elements are all
that arise naturally in prosecution of the
present plan of inquiry, there are besides
many more which might be added.

C H A P.

C H A P. IV.

General plan of an organ capable of true diatonick tune in all its keys.

THE relative pitch of the several degrees of tune belonging to each finger-key being thus ascertained, we are enabled to arrange them as they ought to stand in their places upon the instrument. Supposing them to be represented by organ-pipes, it is plain, that the pipes to be affected by each finger-key must be placed in a row from the front to the back of the instrument; at least this seems the most natural manner of placing them; and that row of pipes must contain all the different degrees of tune which the Table shews are required from the finger-key.

As many of the finger-keys must produce four different degrees of tune, the pipes may farther be supposed to be arranged in four rows, in a transverse direction. These transverse rows will have several

veral vacancies, owing to the unequal number of tones required to be produced by the different finger-keys. See this order represented in Scale N° 46. called *General arrangement of tune upon the organ*: where the rows from the front to the back of the organ are represented by notes contained between the single lines drawn across the staves in form of music-bars, and the transverse rows are represented by the notes that fall upon each of the several staves; the acutest tune being placed highest, and the rest below, in the order of their pitch.

The degrees of tune being thus arranged, it remains to be considered how they shall be fitted for practice. The method first to be proposed is by a set of stops, to be afterwards described.

To explain the operation of these stops, it seems necessary to draw scales for each of the twenty-four keys of music: In each of which shall only be marked the degrees of tune belonging to the key which it represents, placed as in the general

ral

ral arrangement of tune; and all the places of the other degrees which are extraneous to the key represented, shall be left blank. These scales, to distinguish them from the others, shall be called, *Particular arrangement of tune*; (see the Scales from N° 47. to N° 70.)

It may be observed, that although it seems necessary that the several degrees of tune belonging to each finger-key should stand in the situation they are placed in these scales, in the rows from front to back; that so, each being on a line with the finger-key to which it belongs, it may be in the best situation to be affected by it; yet there is no necessity to continue the order they hold in the transverse rows. For any of the degrees of tune may be placed more towards the front or back of the instrument, at pleasure, if such an alteration shall be found to afford any advantage to the organ-builder in forming the stops.

The degrees of tune belonging to all the keys being now distinctly known,
and

and their situation upon the instrument pointed out, the general and particular scales of arrangement being also understood, the ingenious instrument-maker may be sufficiently enabled to form a set of stops fit to open the whole tune belonging to any particular key, at pleasure; the other pitches being all, of consequence, thrown off. The hand of the performer is employed to manage the stops of the organ in its present form, which must sometimes interrupt the performance; but surely it would be more convenient to use the foot. And as there are twelve different signatures of keys, so there must be twelve different places for the stops, which may be arranged along the front base of the instrument, six on the right, and six on the left: but to each of these places there must be two stops, one for the major, and one for the minor mode.

The *stop-keys* (as they may be called) should be made in the form of finger-keys, but much larger, standing at a proper distance from each other. The stop-keys for the major mode may be made of

a considerable length, and placed in a row nearest the ground; another row of stop-keys, formed shorter, being placed over them for the minor keys. Each minor stop being placed directly over the major of the same signature, the whole will stand in so distinct a form, that there will be small hazard of mistake.

C H A P. V.

Of the internal intervals of the diatonick scale; and of the false intervals corrected.

AN instrument, constructed upon the preceding plan, may be said to contain true tune; because all its intervals in each key are perfectly adjusted according to the natural intervals of the diatonick scale.

Although every degree of the diatonick scale, compared with the key-note, has stood the test of the severest examination; yet there are several false intervals, when
compared

compared with one another. These have been considered as internal defects inherent in the nature of tune, and which it is impossible to remove.

Innumerable and ineffectual have been the attempts to reconcile these jarring elements; and every effort made has issued in some proposal to palliate, not to eradicate the evil.

It may be best first to survey these defects; and then, lending an ear to the voice of nature, to follow where she may be pleased to lead. See fig. 71, 72, 73, 74.

In all these figures, called *orders of the chords*, it is easy to compute from each term to another, by the letters G, L, S, what is the interval between the terms connected by the curve lines: and from the Scales N° 3. and 4. it may be found whether they contain true or false quantities. These orders are continued thro' two octaves, and two octaves must contain all the variety that can exist. Indeed there are several needless repetitions in the second octave of each of the orders, to
shew

shew the return of the same course of intervals which appeared in the first.

In the order of thirds, (fig. 71.), the interval between the second of the key and the fourth is marked 3d^l lesser; the grave mark being added to shew that it is less than the true chord of third lesser by comma. The interval between the second and fourth contains a tone lesser and a semi-tone; whereas the true chord of third lesser contains a tone greater and a semi-tone: and this is the only false interval in the thirds.

In the fourths, (fig. 72.), there are two false intervals; one between the fourth and the seventh, which contains two tones greater and one tone lesser. This interval being limma major too large, is marked (*) to distinguish it. Also the interval between the sixth and the second of the key, consisting of two tones greater and one semi-tone, is marked with an acute mark, to shew that it is comma too large. All the others are true chords of fourth.

In the fifths, (fig. 73.) there are likewise
two

two false intervals: One between the second and the sixth of the key, which contains one tone greater, two tones lesser, and one semi-tone; which is comma less than the true chord of fifth, and is therefore marked with a grave mark: Another between the seventh and the fourth of the key, containing one tone greater, one tone lesser, and two semi-tones; which is limma major less than the chord of fifth, and therefore has a flat mark.

In the sixths, there is only one false interval between the fourth and the second of the key; which containing three tones greater, one tone lesser, and one semi-tone, is comma too large: it has therefore an acute mark.

If the preceding system of tune shall furnish the means of correcting these false intervals, and also lead to the discovery of some beautiful properties of tune hitherto unknown, it is probable that the solution of the great problem for attaining true tune will be allowed to be accomplished.

Composers scruple not to admit the second

cond and fourth of any key to stand in counter-point, either as chord of third or of sixth; and the effect in that case is as agreeable as these chords are known to produce in any other part of the scale upon the harpsichord or organ, where they are tempered, and by no means perfect; but upon the violin, or in singing, they are meant to be taken perfect, or as nearly so as the performer is able. In the present indiscriminate method, it is not perhaps easy to say, whether, in performance, the second is flattened comma, or the fourth raised comma, or if both are somewhat altered. The pitch of the fourth seems to be strongly marked, being a conspicuous concord to the key-note as well as to many other notes belonging to the key, (we speak not now of its character in composition, but only of its place in the Scale): and therefore any alteration of it would surely be hurtful. To divide the error, and alter both second and fourth, impairs both.

It would seem, that the whole alteration should be upon the second, making it oc-

O

casionally

casionally tone lesser to the key-note instead of tone greater, as the combination of the second and fourth, or of other notes to be mentioned, shall occur. This will give true concord, without mangling any of the elements of tune.

It has been much agitated, whether tone lesser or tone greater should be placed next the key-note? Different sides have been taken by great theorists. Reason as well as experiment seem to leave the matter undecided and perfectly in equilibrium: custom alone has given the preference to tone greater. When tone greater is next the key-note, the second stands in true concordant relation to the fifth and seventh of the key, and is false to the fourth and sixth: When tone lesser is next the key-note, the second stands in true concordant relation to the fourth and sixth of the key, but is false to the fifth and seventh.

Where circumstances are so equal, it cannot be doubted that nature has meant the second should be changeable. Analogy

analogy likewise seems to indicate this change: for the sevenths, which are complements to the seconds, are acknowledged to be changeable in the key minor; and, for a reason to be afterwards given, perhaps they may likewise be found changeable in the key major. We see already, that the second of the key major is in a fluctuating state in every signature between its pitch as such, and as fourth of the key minor.

This kind of reasoning might be carried much further: but although it may corroborate, it cannot decide; therefore appeal is to be made to actual experiment, which, in all such cases, must be the ultimate judge.

Happily an organ, constructed after the foregoing plan, permits this change with the greatest ease: for if the music be in the greater mode, the performer has only to touch the stop-key of the minor of the same signature, and it makes the change required, without affecting the tune of the key in any other respect.

But what shall be said, if, by this single operation, the whole errors of tune found in the preceding orders of the chords shall be perfectly corrected? Will it not give such sanction to this law of tune, that it were almost a crime to doubt? And will not an instrument, constructed upon these principles, prove the faithful handmaid of nature?

The only false third in the whole system being corrected as above, the false fourth between the sixth and the second, being comma too sharp, is also corrected by flattening this second of the key. The false fifth between the second and the sixth, which is comma defective, by the same flattening of the second is likewise corrected. So also is the false sixth between the fourth and the second, which being comma too sharp, the flattening of the second corrects it. For it so happens, that, in all those false intervals which are defective by comma, the second of the key is the lowest term; and hence, by flattening it, the intervals are increased to their

their just quantity: and when the false intervals are too large by comma, then the second being the highest term, by flattening it they are reduced to their just quantity.

There only now remains the false fourth between the fourth and seventh of the key, which is limma major too large; and the false fifth between the seventh and the fourth of the key, defective by the like quantity; the one being the complement of the other. But the correction of these demands no operation for altering the tune of the instrument: For the natural key major C being the given key, $\flat B$, the fourth of the key major F with one flat, is limma major flatter than B, the seventh of the given key; and this $\flat B$ standing ready to be taken upon its proper separate finger-key, will give the note required. The succession of the keys as they stand in order, from six sharps to five flats, being all perfectly uniform, the fourth of each succeeding key major in that order is marked as an additional note upon the arrange-

ment of the tune of each key major ; for it is in the true pitch as flat seventh to each of these keys.

This explains the meaning of the second staff for the major mode in the scales for the tune of the fiddle, marked flat sevenths and grave seconds. These grave seconds of the major mode are the same with the notes which are the fourths proper to the minor mode: and the flat sevenths being tuned chord of fifth below the fourths of each key, or chord of fourth above them, a more particular account of their regulation for the fiddle seems needless.

But when we arrive at the key major with five flats, the last key major in this order, there is then no succeeding key, the pitch of the fourth of which may be taken as a flat seventh to this key major ; nor is there any degree of tune in the system which exactly corresponds to it: therefore, if it must be procured, a supplementary note, which will be a flat C, must still be added, to answer that single purpose; and it must be tuned chord of fifth
below

below the fourth of the key. This would give the true pitch required, being diesis major acuter than $\sharp B'$; and in arranging the tune upon the organ, this degree of tune would properly stand upon the second staff from the foot of the scales of arrangement, and in the division belonging to the finger-key B; while B and B' would be removed each one staff higher.

It may be noticed, that the want of a supplementary note does not shew any defect in the system of tune. For it is plain, that if the same course were still to be pursued to form a key with the signature of six flats, that key would afford the note wanted: it is also plain, that this train would lead to an infinite series of new keys in either direction. But this observation points only at one of the simplest and least important circumstances of which these new ideas of tune seem to promise a discovery, if a more advanced inquiry should be entered upon.

C H A P. VI.

Objections to the constitution of the Scale removed; the diverging nature of tune explained, and the manner of preserving or restoring the original pitch.

HAVING explained the nature of the organ, we next endeavour to shew, that the scale of music is free from some other imperfections that have been conceived to exist in it; and to answer some objections, founded upon certain particular phenomena hitherto unexplained.

It must be observed, that, in forming the preceding system of tune, the common language of theory has been used, as if that theory had been received by universal consent, which is not the case. The difficulties which have been already stated and removed, have always been regarded as real inconsistencies inherent in the constitution of the Scale. Demonstrations have been delivered, by very many of the greatest

greatest theorists, of the impossibility of removing them ; and hence the truth of the principles has been suspected. No wonder, then, if, besides the objections arising from such facts, others, founded on conjecture, should have been added, and which also must be removed. But, in the mean time, let it be considered, that since this system of tune is strictly subjected to the judgment of the ear, and arises from experiments actually made upon the violin, all perfectly agreeing with theory ; it would have been unreasonable scepticism to have refused to adopt doctrines so well confirmed and suited to the present purpose.

One capital difficulty, however, still remains, which if once removed, the remaining objections might be left to receive their answer from the instrument itself ; for it is not doubted but that it will speak home in such glowing harmony as must bring irresistible conviction.

The neglect of the difference between tone greater and tone lesser in practice, and
of

of other circumstances already noticed, has occasioned much false composition; and false composition, although performed upon an instrument whose tune is absolutely perfect, must still yield imperfect music. In order, therefore, to vindicate this system of tune from the charge of errors which may be discovered when such an instrument as has been described may be employed to perform such compositions; and also, to put future composers upon their guard; notice shall be taken of an observation made by Mr Huygens, which will throw a clear light upon the matter. It will likewise explain a phenomenon which has hitherto been conceived to indicate another inconsistency in the principles of music, but which is the link which connects the whole, and binds the parts together in one continued chain.

Mr Huygens observes, that if a person sing the notes C, F, D, G, C, alternately ascending and descending by perfect intervals, the last note C will be flatter by a whole

whole comma than the note C with which the finger begun.

Many other *chaunts* (as they may be called, after the example of Mr Huygens) might be composed of the degrees of the diatonick scale, all producing similar effects; some raising, and others depressing the pitch of the key-note: The chaunt C, A, D, G, C, producing exactly the same effect with that remarked by Mr Huygens; and C, G, B, C, if sung in perfect concordant intervals, alternately descending and ascending, would alter the pitch of the latter C by no less than the full elementary semi-tone. If the one of these is charged as a defect or inconsistency in the scale of music, so must the others: but the last being most remarkable, could not escape the notice of musicians; and though well known to them, it has never been stated as a blemish in the scale, because it is known how the tune may be led into concord with the key-note by the interposition of other notes. But, in Mr Huygens's
chaunt,

chaunt, this difference of comma being hitherto neglected in practice, and its laws not attended to nor understood, the discovery of its effect striking him with surprise, he considered it as an unaccountable circumstance, occasioning a real blemish, or at least inconsistency. And this notion has continued to mislead all who have considered the matter since his time.

But it is plain from all that has been said, that it is only by tracing the progress of tune by perfect intervals, properly chosen, the nature of which is to diverge from the immediate concordant relation of the ground-note, that we have been enabled to join the whole twenty-four keys of music in one uninterrupted chain, whose links are all, in Mr Huygens's own words, "*intervalla consona omnino perfecta.*" It is equally plain, that, by the same means used to diverge from the direct concordant relation of the ground-note, the tune may likewise converge or be restored to it. Thus, in the last chaunt C, G, B, C, if the notes D and G be interposed between B and the
last

last C, the pitch of the fundamental note will be perfectly restored: and C, G, B, D, G, C, is a chaunt which, if sung in perfect concordant intervals, will lead to the precise pitch of tune from which it set out. So also, with respect to Mr Huygens's chaunt, C, F, D, G, C, we know, from what has been said upon the regulation of tune, that if D', the second of the key, be tuned perfect chord of third downwards from F, the fourth of the same key, the interval between D' so tuned, and the key-note C, must be tone lesser. Therefore, to mark the pitch of D in Mr Huygens's chaunt with precision, it must have the grave mark; and the chaunt will stand thus: C, F, D', G', C'. For G and C must also have the grave mark, the tune of these last notes being thus flattened comma below their pitch as fifth and key-note. If, then, another D' is made chord of fifth above G', this last D' shall be a just octave to the first D'; and from this D' to F above it there is a just interval of chord of third, or to F below there is a just interval

interval of chord of fixth: and again, from F to C, the interval is just chord of fourth or chord of fifth, as the step is taken ascending or descending; and the original pitch of C will thus be perfectly restored, and the chaunt will stand as follows: C, F, D', G', D', F, C. This chaunt may proceed by perfect concordant intervals, whether the notes are taken in succession upwards, downwards, or alternately, and still restore the precise pitch of the first C or of its octave. And by the like means may the tune of the ground of the chaunt C, A, D', G', C', or the tune of the ground of any other diverging series of concordant intervals, be perfectly restored, let the case be as it will.

In giving the above examples, it is not meant to dictate to composers, whose feelings and experience, after they are well acquainted with the effects of this refined system of tune, will best inform them how far such diverging process of tune may be admitted into composition, and by which of the several means which the system affords

fords it ought to be restored: but only to shew, that there is, in the nature of the thing, no impossibility of proceeding in any direction, and to any distance from from the immediate concordant relation to the ground-note, by perfect concordant intervals; and also of returning by them to the original pitch. For how indeed can it be otherwise, when every single pitch of tune in the whole range of keys has been shewn to be genuinely derived from one ground-note; and consequently they are all truly related to each other, either immediately or mediately, by the intervention of more or fewer perfect concords?

It is now likewise perfectly plain, that, by attending to the grave and acute marks, as well as to the sharp and flat, composers have it in their power not only to form their melodies, but also their harmonies, as perfect as they choose, whether the ground of the music continue in the direct concordant relation to the principal key-note, or diverge from it. This will justify what was formerly said, page 99, that
the

the deviation of the tune of the fiddle may be effected without the smallest violation of the just quantity of any interval of tune.

To enable those who choose to study the nature of this property of tune to know its whole extent, it is only necessary to observe, that it depends altogether upon the situation of the false intervals of the scale, the knowledge of which may be easily obtained by perusing the figures 71, 72, 73, 74; and that the restoration of a diverging series of tune, as well as the rectification of the false intervals of the Scale, is effected by means of the changeable seconds and sevenths.

But it may still be further observed, that, in passing from the fourth of a key major to the second, and thence proceeding in the composition of a tune, there is no direct necessity to diverge at all from the immediate concordant relation of the key-note, nor in any respect to injure the perfection of the succeeding intervals; for the composer has it in his power to pass
directly

directly from this grave second to the sixth of the key, by which the interval becomes true, whether taken ascending or descending: for the sixth greater succeeding this grave second is a true interval, being the just chord of fourth if taken below the second, or a just chord of fifth if taken above it: and thus the original pitch of tune is still preserved. And C, F, D', A, C, may proceed by perfect intervals without diverging at all, notwithstanding the introduction of the grave second. And further, nothing forbids to pass directly from D' to the key-note C, or to the third of the key E, by the tone lesser or the tone greater, which are both true degrees of the natural diatonick scale.

Thus, in this as well as in the former case, the grave second may be introduced, and the perfect relation of the tune of the key-note still preserved entire: and, in general, a little attention to the figures 71, 72, 73, 74, will give a clear idea of every method by which, in all cases, the original pitch of tune may be allowed to diverge, and how it may be restored.

P

Whether

Whether it may be found proper to allow tune to diverge in this manner, and what may be the effects and limits, now that an instrument is found capable of definite and accurate tune, are inquiries which, with many others, seem to arise; but which cannot now be entered upon consistently with the present plan.

Two more views shall only be added of the mutability of this second of the major, or fourth of the minor mode; for it is the same degree in the scale, and the same too in respect of this property, by whichever of these names it may be distinguished. Speaking of the keys natural, it may be called *D*; and instead of talking of the second of the key major, or of the fourth of the key minor, we shall compare the relations of *D* and of *D'* to the other degrees of tune belonging to the natural signature. It is hoped, that the necessity of illustrating such a novelty in the doctrine of tune will plead an excuse for dwelling so long upon it.

Both *D* and *D'* stand in relation to *C* as
true

true diatonick intervals; and I doubt not, that, in a more advanced inquiry, they may be shewn more emphatically to merit that epithet.

In a series of notes in the diatonick order, comprehending both the major and minor modes, it will be found, that, by taking D and D' alternately, the whole intervals of the Scale will become perfect, either ascending or descending. See fig. 75. The black lines join those notes which form betwixt them perfect concordant intervals; and the pricked lines those which are called *true diatonick intervals*, but hitherto not admitted to the title of *concord*.

This figure sets the two D's upon such a footing of equality in respect of their concordant relation to the other degrees of the Scale, and hence the changeable state of D is so evidently marked, that it seems wonderful that such a palpable law of tune should have lurked so long in concealment; for, tracing the connection either forwards or backwards upon the figure, from the two D's through all the

other degrees of the diatonick scale, by the connection pointed out by the black lines, they will appear, without exception, to stand alternately in true tune to the other degrees.

To those who are acquainted with the principles of musical composition, this law of the alternate relation of the grave and acute seconds will shew itself confirmed in all points of view. For when the second of the key becomes the fundamental bass-note, its harmonics being the fourth and the sixth of the key, this fundamental note must be grave. The third of the key being the fundamental bass-note, and the chord admitting a discordant seventh, which in this case is the second of the key, this second of the key must be acute; because the harmonics of this fundamental are the fifth and seventh of the key. When the fourth of the key is the fundamental bass-note, and the chord admits of an added discordant sixth, which in this case is the second of the key, the harmonics of this fundamental being the sixth
of

of the key, and the key-note, the second of the key must be grave. When the fifth of the key becomes the fundamental bass-note, the second, being one of the harmonics, must be acute. Thus, in every point of view, the mutability of the second of the key seems to be ascertained past all doubt.

It is an object of no small curiosity to observe, that instead of the resolution of a single discordant relation in the leading chord of a regular cadence, this view of the matter discovers a resolution of two discordant relations made by the same movement.

The leading chord consists of the 5th, 7th, 2d, 4th.

The resolving chord, of the Key 5th, 8ve, 3d, &c.

The lines drawn from the notes of the leading chord to those of the resolving chord, shew the movement of the parts. In the leading chord, the second must be acute, because it is a fifth to the fundamental; and consequently both the intervals which the second and the seventh

make to the fourth of the key in the leading chord are false: and both are resolved by the same movement; of the second and seventh into the octave of the key-note, at the same time that the fourth moves into the third: and the effect must be exquisitely delicate when produced by an instrument accurately tuned.

When, by repeated attention to the finer circumstances and connections of the scale of music, one is enabled to gain a clear and extensive view of its constitution, the whole presents itself in the form of a most beautiful plexus, infinitely more pleasing to the imagination than the most regular, but dull, though uniformly connected series, which hitherto seems to have been the *desideratum* in music, to supply the place of the broken and mutilated figure of the present established system. But however beautiful this view of the system of tune just now presented, (and indeed the very idea of it seems to whisper music, agreeing with Mr Hutcheson's definition of beauty, *variously regular*), it
seems

seems to fall greatly short of what promises to arise from a more advanced inquiry into the subject.

The difficulties hitherto reviewed seem to have been real ones, and such as have occurred to ingenious minds sincerely disposed to search after truth. But men, having once wandered from the right road, and finding themselves bewildered and involved in inextricable difficulties, become impatient and averse to acknowledge that these difficulties proceed from their own mistake. This has produced assertions, that there is something in the nature of tune which will not admit of rational explanation ; a sort of unaccountable variation, which, although great performers acknowledge they cannot explain, they yet pretend to practise : as if they would insinuate, that the gross touch of a finger can distinguish with greater nicety than the powers of intellect itself. But after considering what has been shewn to be the practice of the greatest masters of the art, and will be found to prevail in

every composition for the violin, notwithstanding the instrument is capable of true tune; perhaps it may not be judged unfair to suppose, that these masters, knowing that the imperfections of other instruments are not imputeable to the fiddle, and also that there was no certain criterion by appeal to which they might be convicted of error; finding besides, that sometimes the place of the finger is varied in striking a note, either missed or otherwise, as chance would have it, by the tune of an open string; they were willing to pay a compliment to the delicacy of their own performance, and, instead of attributing the variations to their own error, have imputed them to the nature of tune itself, and asserted, that there is a kind of variation in tune totally inexplicable, but which the touch of their *delicate* finger can exhibit *clearly* to the ear. How gross such reason! how exquisite such touch!

Such assertions are not easily combated, but the authority of masters in any art is
apt

apt to bear such a sway, that it seems necessary to throw as clear a light upon this matter as it may admit.

Could it indeed be proved, that, in the execution of any piece, the performer stops every note in such tune as to make the most perfectly agreeable melody of which the composition is capable, and at the end finds a variation in his tune from the original pitch of the key-note, different from what may be accounted for by the diverging properties of tune already explained; in this case, nothing would be left but to submit and acknowledge the irrationality of the laws of tune, or rather to confess that its principles are not yet discovered.

In order to judge of a pretence to such delicacy of execution as might discover a variation in tune different from that already explained, it is necessary to recollect what has been said of the exquisite nicety of touch that is required in the approach to true tune. This being compared with what has been the practice of the greatest masters, the vanity of such a pretence

pretence will become sufficiently apparent. And it would seem more probable, that when such deviation happens, it must arise from the errors of the musician, not from the nature of tune.

But does not the pretence of a musician to perfect performance, in opposition to mathematical deduction, founded on the most deliberate and accurate experiments, amount to no less than setting up his own hand, nay the random touches of it, as the standard of perfection? A very bold pretence surely, however bewitching the heights of excellence to which he may have attained.

If the composition proceed diverging from the original key, and it were possible that the performer could take every step in just tune, there is no difficulty to account for the greatest deviations upon the principles now discovered.

Nay, supposing the whole composition to be kept true to the key-note, but allowed to modulate into different keys, still keeping true to the key-note last assumed,

sumed, it is plain from the tune of the organ, that the difference of tune belonging to the same nominal note will often be no less than double comma. See the *Table of Comparative Degrees*: which shews *C' to *C'', and D to D'', and E' to E'', &c. all different from each other by double comma; while, by the same Table, the differences of the pitch of other of these notes, nominally the same, are so exceedingly minute as the ratio 32805 : 32768. It would be astonishing indeed, if these could all be stopped with strict precision in rapid execution. It seems almost impossible in the simplest performance. But those who pretend to such execution as discovers the anomalous variation now treated of, actually profess to do more.

It seems therefore highly probable, that the pretence to such a discovery is no more than an apology for ignorance; and the absurd consequence that must follow upon such a supposition, sufficiently evinces its futility.

Musical sound has already been defined
to

to be, that sort of sound which is smooth and even, in opposition to confused noise or continuous tune. The first part of this definition cannot be challenged. On the second, respecting continuous tune, let it be considered, that when the finger is slid along a sounding string, the sound indeed may be smooth, but the effect is shocking: and although this kind of tune may sometimes be admitted into burlesque performance, it can never be considered as musical.

The offence from continuous tune is still the same, whether the rise or fall be quick or slow: the smallest perceptible alteration of tune in that style is always disagreeable. Can it then be supposed, that there is any thing agreeable in any degree of it so minute that it might escape the notice of sense? The nature of the thing must be the same, whether it be quickly or slowly produced, or whether the alteration be great or small, since, like the circumference of a circle, every part of it is similar.

But

But there are only two possible means by which the pitch of tune can be varied in the act of performance; of which this continuous motion of tune is one: the other is a variation in the degrees of rising and falling by distinct intervals; so that, in passing from one degree to another, and endeavouring to return by the same interval, we either exceed or fall short of the original pitch.

It has been seen, how this may happen indirectly, by pursuing a certain order of harmonic intervals; and its laws and limits are now known: but if the anomalous variation now mentioned means any thing, it must mean more, That the attempt to ascend and descend by the same course of intervals will generate a variation.

Let it then be supposed, that every particular descent exceeds the rise made in attempting to return by the same interval, and that this is really known to produce the most tuneful melody; the more frequent, therefore, the rises and falls of any piece of music, the lower it must fall
in

in the general pitch of tune, if performed by such able masters as are capable to do it in perfection. But how will a concert go in this case? The first fiddle must gallop down-hill out of sight before the rest; and if the concert continue for any considerable time in this mode of proceeding, the bass will at last become the acutest of all the parts; how much for the improvement of the music, is left to every one to determine. For it is clear from this hypothesis, while the different parts have some more and some less division of their notes, they cannot for a moment remain in agreement with each other. The same absurd consequence must follow, if the variation shall be said to arise from the excess of ascent; nor does it alter the case, should the excess of ascent or descent be attributed to all, or to any particular interval, or to the differences of the sums of the excesses of both.

Therefore, while the agreement of different parts in concert, that are unequal in the number of their rises and falls, is admitted,

admitted, one cannot but reject the notion of such an anomalous variation of tune.

To attribute the variation to continuous tune would offend against musical sentiment, much in the same manner as the denial of the truth of an axiom would shock a mathematician: And there is no other way by which the variation of tune can happen but by error in performance, which seems not so hard to be conceived.

The well-known fact, that vocal performers, when unsupported by an instrument, find their pitch fall towards the end of a performance, is also brought in support of this supposed unaccountable variation in the nature of tune: because it is alleged, that the voice being more immediately under the direction of the will of the performer, he is altogether at liberty to follow his own sentiment; and if so, this depression must be dictated by some natural feeling.

This points at something more particular; and seems to confine the variation of tune always to one direction, tending constantly

stantly to flatten the original pitch. But a little reflection upon the nature of the diverging properties of the Scale will shew, that the variation's proceeding from that cause determines the change as readily to the side of acuteness as of gravity. For example, if the chaunt C, E, G, D, A' C', be sung in perfect concordant intervals, either ascending, or alternately ascending and descending, the last C will be found to vary from the first pitch, and to be raised comma sharper than the pitch of the first C or its octaves: therefore this variation of the voice must depend upon something entirely different from the diverging properties of tune already explained.

The fact cannot be denied. And, before examining into its cause, it may be noticed, that there are many people possessed of exquisite discernment in music, who have so little command of voice, as scarcely to be able to produce a few tuneful sounds; nay, that the same person will sing much better in tune
at

at one time than at another: therefore it would seem, that we cannot reason from command of voice.

This variation, and the peculiar direction it takes, seems easy to be accounted for from a very different cause than the sentiment or choice of the singer.

The power of preserving an equality in the pitch of tune in singing, is allowed to be owing to the power of preserving an equal degree of tension in the muscles of the larynx; and the smallest relaxation occasions a proportionable falling of the voice. As this tension requires a continual and equal exertion of the animal spirits to support it, it would seem a much greater wonder to find that this exertion was equally preserved through the whole of a performance, than to find that a small relaxation did frequently happen, and by that means the voice should imperceptibly slide from the first pitch of tune, even against the inclination of the performer.

Let the pitch be given from whence a song is to begin, and let the variation be

Q

carefully

carefully noticed at the end: the pitch being again given, let the song be repeated; and it will be wonderful indeed if the variation is found exactly the same as before. If it is not, it must be owing to error; and such variation cannot be traced from any secret principle or property in the nature of tune.

It is well known, that if there be any considerable difference in the state of the animal-spirits, the degree of variation will be remarkably altered; that is, it will be sensibly greater when the spirits of the performer are flat than when they are lively. This so clearly marks the dependence of this variation of tune upon the corporal habit of the finger, that we cannot have recourse to any other cause.

CHAP.

C H A P. VII.

Of a new opinion concerning the connection between musical ratios and those of a circle.

IT seems necessary to examine a modern doctrine, which, although not yet published, has been communicated to many; and the respect justly due to the great ingenuity of the author will probably give it a degree of credit which may bias the judgment, and determine some to withhold their assent to the truth of the preceding discussions.

In this doctrine of Mr Harrison, of which some general account is given in the Preface to Mr Smith's *Harmonics*, and of which I have heard some further accounts from the author himself, the ratios of tune are said to be best discovered by considering the ratios existing among certain straight lines drawn within a circle. One of the conclusions is, that we must abandon the distinction of the tone

Q₂

greater

greater and the tone leffer; and reduce the elements of music to tones of equal dimensions, and semi-tones also equal to each other; each semi-tone being the just half of a tone. This conclusion, if just, would overturn all that has been said in this Essay, and with it all that has been established by the consent of ages, and the most accurate experiments of the greatest philosophers, as well as of musicians and musical mathematicians, from the earliest dawn of Greek literature down to the present time. It must be acknowledged, that one good effect would follow: it would greatly facilitate the study of music, and render the truth of tune much easier to be attained than has hitherto been supposed. But, to balance this advantage, it would most fatally deprive us of that beautiful variety which the foregoing sheets seem to discover, and which a more advanced inquiry into the nature of tune will greatly enlarge.

Modern philosophers have exploded the ancient hypothetical mode of inquiry, and
pay

pay a strict attention to the nature of the particular subject under consideration. Whatever similarity may appear among the general conditions of any two objects, yet if every quality discovered in the one be not equally found in the other, no reasoning is permitted from the one to the other. If they are right, the author of this new doctrine must be wrong. For surely our perception of the proportions of straight lines drawn within a circle, is not very obviously similar to our perception of the agreement of musical sound; nor does it appear prudent to rely upon an examination of the one for explanation of the other, while we have that other itself before us.

Most accurate experiments have been made upon bended cords; the matter, thickness, and tension of which have been made as equal as possible, and differing only in length. From these experiments, often repeated, it has been found, that two bended chords, whose lengths are to each other as 3 is to 4, being found-

ed together, the ear perceives the concordant relation of chord of fourth. When the lengths are to each other as 2 to 3, it perceives the chord of fifth.

Let there be three bended chords, differing only in length, the longest divided into twelve equal parts, another in length equal to nine of these parts, and the last equal to eight: if the cord twelve be sounded with the other cord eight, these two sounds will produce the concordant relation of chord of fifth; because 8 is to 12 as 2 is to 3. Again, if the cord nine is sounded together with the cord twelve, the two will produce the chord of fourth; because 9 is to 12 as 3 is to 4.

Mathematicians have shewn, that the number of vibrations performed in the same space of time by two cords differing only in length, are in reciprocal proportion to the lengths; and the difference of the lengths of the two shorter cords being as 8 is to 9, the cord nine shall perform eight vibrations in the same time that the cord eight shall perform nine vibrations. Thus
the

the difference of tune which gives the chord of fifth from that which gives the chord of fourth, is radically established; and this difference is the tone greater.

It has likewise been found, that two bended cords, (*cæteris paribus*), whose lengths are as 3 to 5, being sounded together, produce the chord of sixth greater. Supposing, then, other three cords, differing only in length, and that their lengths are as 9, 10, 15: if the two cords 9 and 15 are sounded together, the concord of sixth greater will be perceived; for 9 is to 15 as 3 is to 5. Again, if the cords 10, 15, are sounded, the chord of fifth will be perceived; because 10 is to 15 as 2 is to 3. Therefore, according to what has been already said, the difference between the degree of tune which gives the chord of fifth, and that which gives the chord of sixth greater, is a ratio of 9 to 10; which is tone lesser.

And the ratio of tune 15:16, called the *elementary semitone*, being the difference between the third and the fourth of the

major mode, is established by the following experiments.

The lengths of the bended cords which, when sounded together, produce the chord of third greater, are as 4 to 5. The lengths of the cords which produce the chord of fourth are as 3 is to 4. Of three bended cords, whose lengths are as 15, 16, 20, if the two which are as 16 to 20 are sounded together, the chord of third greater will be produced; because 16 is to 20 as 4 to 5. If the other bended cord 15 is sounded with the cord 20, the chord of fourth will be produced; because 15 is to 20 as 3 to 4. The ratio, therefore, of the interval between the greater third and the fourth of the scale, is as 15 to 16: and the experiments which prove that these ratios take place in the other parts of the scale, are pointed out by every writer upon the theory of musical sound.

Whoever doubts these experiments, may easily make trial; and if they are found to hold true, he must either acknowledge the true quantities of the elements of
tune,

tune, or deny the evidence of the first principles of arithmetic.

I have heard a fix-stringed viol, fretted according to the rules of this new doctrine, played upon by a most unexceptionable performer, (Mr Harrison himself), and found no difficulty to point out its errors, to the conviction of the performer; whose only defence was, that it was impossible to put an instrument in better tune.

Honour is due to the ingenuity of Mr Harrison: and although his system must be condemned, his spirit is to be ranked with that of the conqueror of the world; who, because he could not untie the Gordian knot, cut it in pieces. But the knots of science are composed of that adamantine twine which, if they cannot be loosed, refuses to be cut.

C O N-

CONCLUSION.

Limitation of the present plan of inquiry.

HOWEVER certain it appears, that, by fortunately stumbling into the right track, some of the true principles of music have been disclosed, the application of which to practice must highly improve the art; and, besides that, if the train were pursued, it would lead still to further and greater discoveries; yet it is proposed to rest here at present.

For although Dame Nature seems not over coy when we get the cue of her address; yet she keeps fully up to her *etiquette*, and is only to be won by punctilious attention: an attention, which the present fate of scientific discoveries seldom justifies the author for having bestowed.

Whether the inquiry shall be resumed, is uncertain: but, before dropping the curtain, it is to be remarked, that the subject seems far from being exhausted. It has been pursued considerably beyond
the

the present limits ; and seems to promise a large acquisition of materials for varying and exalting the powers of musical expression, both in melodies and harmonies, naturally suggested from theory, and confirmed by experiment.

A more advanced inquiry would show, that these acquisitions, which improve the effects, will not add to the difficulties of the practice of music, upon instruments properly constructed ; nor does any thing occur from reflection that seems to obstruct the reformation of our present instruments, the trumpet kind only excepted.

It may likewise be noticed, that small progress was made in this Essay before it was discovered, that the subject leads to a greater length than the mere solution of the foregoing difficulties. An inquiry at large seemed a task too heavy to be undertaken at once. The present plan was therefore limited to the views that have hitherto been given by the most approved theorists. But, upon more attentive examination, some of the received ideas concerning

cerning the properties of the scale of music appear erroneous. These could not be made subjects of discussion in this Essay, without introducing matter foreign to the present plan; nor should they be altogether passed over in silence. It seems sufficient at present to say, that the immediate object of inquiry did not require their correction.

A P P E N.

A P P E N D I X.

HINTS *for Practical* IMPROVEMENTS.

IN the preceding Essay, there has only been produced one single plan for the formation and management of the stops of the organ, in modulating from one key to another. The tune peculiar to each of the twenty-four keys of music being separated from the rest, and a method pointed out whereby any of the keys may be introduced or thrown off at pleasure, a distinct view of the subject is thereby preserved. But various means may be devised for improving upon this plan, and rendering the command of every pitch of tune, separately, universal over the whole instrument. One of these may be as follows:

Let

Let a cylinder be placed upon the organ, that may act upon the degrees after the manner of the barrel of a musical clock; not for performing the music, but for opening and shutting any of the pipes assigned to each finger-key, as occasion may require. When a change of any of the degrees of tune becomes necessary, the cylinder may be turned by pressing the foot upon the spoke of a wheel, conveniently situated, and contrived to communicate its motion to the cylinder. The pins which act upon the hammers of a musical clock are stuck into the barrel; in place of this, the surface of the cylinder of the organ must be provided with grooves fitted to receive sliding pieces, each of which sliding-pieces, having a pin stuck into it, may be drawn readily to the point, where it will act upon any particular degree of tune required. Thus the cylinder may be previously prepared for the performance of any piece of music.

An index of tune should be marked upon every musical composition, for directing

directing the preparation of the cylinder; and corresponding marks should likewise be placed over or under the musical notes, where a change is required, for directing the performer when the cylinder ought to be turned.

The index may be made by marking in the first place the letters, with their proper signs, which represent the notes with which the tune begins: and when, in the progress of the music, any note appears, requiring an alteration from the original pitch, a small asterisk may be placed under it, to show that the cylinder should then be turned; and another asterisk being put in the index, the new degree of tune should be marked immediately after it: and so on to the end of the composition.

This is exemplified in St David's tune. See Scale N^o 78. This tune being written in score, the asterisks shewing the changes of pitch are marked below the bass only, even when the change of pitch happens in one or other of the upper parts. The first

first asterisk shows, that G of the bass is changed to G': The second shows, that the same note is to be restored to the former pitch: The third, that it must again be made G' in the treble: And the fourth asterisk shows, that it is finally to be restored to G° in the tenor or church part.

Upon every account, this last method seems greatly preferable to the other; since by it the instrument may be qualified to introduce any particular combination of degrees, and to change and restore any single note at pleasure.

It would be advantageous to have two wheels fitted to the same axis, one for each foot, to serve in case of a quick succession of changes of degrees.

It is easy to foresee, that the number of tones which this system of tune requires to complete the octave, will probably be considered as an objection by those who are disposed to find difficulties; and indeed may startle others who, sincerely wishing to promote every improvement, are heartily inclined to judge with candour.

But

But nature imposes no such load; tho' men often, through their own mistake, oppress themselves with intolerable burdens. The vast apparatus of musical keys and signatures, with which musicians have been long encumbered, is plainly a burden of this kind, and may be safely dropped without any loss to the art. Nay, it is certain, that it must one day appear, that the discharging the system from such lumber will make way for the introduction of the most valuable accessions. The present plan of inquiry does not admit of entering into an investigation at large; though a general inquiry shall be attempted, upon the received principles of tune, into the merit of the present system of twenty-four keys, and afterwards into what may truly be styled a *system of tune*.

But if it is required that an instrument should be furnished with the degrees of tune fit for twelve signatures, and if it be true that no fewer than those already mentioned will afford true tune, it is here the station ought to be fixed from whence we may

R

take

take the subject under our eye: and looking down to the hemitonick system of twelve degrees of tune, where each stands in place of not less than three, but often of four different pitches, very many of them differing by no less than double comma; we shall be apt to wonder how it is possible that such a system could at all produce music to which we could listen. Again, the station being changed, and experiencing that delight which even this hemitonick tune is able to give, when we shall look up to the other, how does it raise our ideas of the effects of music, when thus refined, and produced in all its purity? The very number of tones requisite demonstrating the grossness of the one and the purity of the other, instead of proving a discouragement, becomes the sharpest spur to quicken industry.

I am but little acquainted with the internal structure of organs; but there is reason to believe, that very many of them, in the present imperfect form, are furnished with more than triple the number of
pipes

pipes to each finger-key which this refined system of tune requires: and this, too, for the sole purpose of obtaining variety of noise; for, pure and distinct tone being the true *materia musica*, all other differences of sound in contradistinction to this deserve no better epithet.

If the common organ often contain such a number of pipes, it is plain that an organ may be constructed upon the present plan, which shall have no more pipes, and yet be fit to give three tones in unison to every degree of its tune; and if it has been thought worth while to labour for variety of sound, true tune is certainly a nobler object to excite ingenuity.

It may likewise be observed, that as every additional signature introduces some additional pitches of tune into the system; so if some of the more unusual signatures are spared, which may well be done, the task would be considerably lessened.

In short, if this view of the relations and progress of tune shall be approved, it becomes necessary to submit to some additional

labour; for nature will not bear to be forced from her place: otherwise we must fold our hands, with the sluggard, and say, *There is a lion in the way.* Perhaps the following inquiry into what may be properly called *the system of tuneful sounds*, may serve to alleviate the task.

Previous to this inquiry, we may remind the reader, that it is upon experiments made upon bended cords, after the manner mentioned in pages 245, 246, 247, 248, that the true tuneful relation of musical sound has been discovered; and that the degrees of the diatonick scale, as they have hitherto been reckoned, whether in the major or minor mode, are in number seven, and the octave. But the inequality of the intervals among these degrees, the impossibility of a common divisor, and the other circumstances already stated relative to the supposed imperfections of the scale, have hitherto shewed it, in a variety of points of view, to be impracticable in its perfect form. Of the three natural elements two were found to be nearly

ly

ly equal, and the third not much exceeding the half of either. Necessity, therefore, compelled musicians to suppose an equality of the natural tones, and also that semi-tone was the half of the undistinguished tone.

It being likewise found, that there are five tones and two semi-tones in the octave; by dividing these five into halves, and adding two half-tones representing the two elementary semi-tones, the octave thus came to be represented by thirteen notes, comprehending twelve intervals, equal, or supposed to be equal, to each other. The purpose of this division was to enable the musician to change his key at pleasure, and still have it in his power to proceed by the same proportionate degrees to the new key-note as he did to the first key-note. This suggested the invention of sharp and flat marks for the signatures, to direct to the manner how this gross system of tune should proceed from each of these half-tones; and there

R 3

being

being twelve of these half-tones in the octave, there were required twelve signatures for directing to the degrees of tune related to each of them considered as a key-note.

Hence musicians acknowledge twelve signatures, and no more; each of which containing a major and a minor mode, as has been explained, they amount in all to twenty-four keys of music; which continues to be held as the system of music to this day.

As it has always proved dangerous to combat errors which have gained an establishment from length of time, it seemed best to adopt this system, and pursue it through all its mazes: and accordingly there has been given a complete regulation of all these twenty-four keys.

Although it plainly appears, that this progress might be continued *ad infinitum*, and therefore that the number of signatures and of keys might be increased indefinitely; yet, still to adhere to the received opinion, the system of twenty-four keys has been allowed to set bounds to this plan. But, from what has yet been discovered

discovered of the nature of melody or harmony, these twenty-four keys seem much more than sufficient to yield all the variety that composers have hitherto, but very imperfectly, aimed at.

Before venturing to inquire into what may be esteemed a system of tune, to remove established prejudices, and that the reader may be prepared to think liberally, he may deliberate with attention upon what has been said, That the hemitonick scale is a false division, and has only been adopted as a succedaneum, to supply the want of a division founded upon the true principles of nature: That this true division being now discovered, shows the progress of tune to be really infinite; and therefore that this limitation to twenty-four keys, which is founded on error, has no title to be considered as a system preferably to any other limitation, at least for ought yet known. Therefore we may hold ourselves at liberty to inquire with freedom into the number or combination of keys, signatures, or *notes*, which ought

to be admitted as a system, and which will give the whole variety that tuneful sound can afford. If this could be found, there would be no reason to doubt of its title to be received as the true system of musical sounds; all beyond which would only be a repetition of the same circumstances, and therefore the same in real value, however differently modified for an unmeaning affectation of variety.

It has been formerly hinted, that there still are concordant intervals not yet defined or discovered by musicians. It is necessary therefore to notice here, that the following inquiry is confined to the limits of the plan of this Essay; that is, to the tuneful intervals already admitted by theorists, and to the doctrines taught concerning them. What follows will therefore give but a very imperfect view of the system of tune, but may prove an excellent preparation to an inquiry at large.

Whoever may enter upon such an inquiry with judgment, will probably find, that instead of extending the limits of the following

following idea of a system, by the addition of new keys and signatures, there may be reason to strike into the opposite track: and if experiment be admitted as a guide, means will not be found wanting to enrich the system with a beautiful variety of additional members, while the general idea becomes more simple, and the whole perhaps better suited to practice.

But if the right track be not entered upon and pursued under favourable circumstances, ages may pass before much improvement is made. What follows may prove the means of introducing a high practical improvement in the mean time, and of leading forward to better.

Recollecting the order of the keys, page 38, in modulating from one key to another, it is generally supposed to be disagreeable, (notwithstanding that some composers have actually affected to introduce such passages), if, passing over the immediate preceding or succeeding signature to the present principal key, a transition should be directly made to any of those
keys

keys which belong to a signature at a greater distance from it. For example: If the given principal key be either the major or the minor of the natural signature, a composer may agreeably and properly change the key, either for the other key belonging to the same signature, or into one of the keys belonging to the signature with one sharp, or with one flat. But should he attempt to pass directly from either of the keys of the natural signature to one of those belonging to a signature with two or more sharps or flats; such a change is generally held to be unnatural, from the disagreement of the tune of the given key with that of the newly introduced key. If, then, the principal key cannot be agreeably changed for any other which belongs not to the tune of the same signature, or to the tune of the signatures immediately preceding or succeeding the signature of the given key, and if all the signatures succeed each other in their order in perfect uniform relation, there cannot possibly exist any difference

ference of circumstances in passing thro' all the signatures in their order, than may be found in modulating from a given signature to the preceding one by one direction, and thence returning again and passing to the succeeding one in a contrary direction. Therefore three signatures, comprehending three keys major and three minor, must yield all the variety that the diatonick scale is capable of affording, and seem better entitled to be called *the system* than any other limitation whatever.

It has been already shewn, that in a series of musical keys, in which the several pitches of tune are all truly adjusted, if a change be made from one key major to the next in order of succession, two alterations must be made in the pitch of the notes. If the change be made by addition of a sharp to the given signature, these alterations fall upon the fourth and the sixth of the given key, which stand in the places of the seventh and the second of the new key: that is, if the natural key major C is given, and from thence it is required to make

a transition to the key major G with one sharp, the note A, which is the sixth of the given key, must be raised comma; and the note F, which is the fourth of the same key, must be raised limma major. Again, if it be required to go directly from the same given key into the key major D with two sharps, the requisite alterations fall upon the notes A and E, which must be raised comma; and upon F and C, which must be raised limma major. But if a change be required to be made from the same given key into the key major A' with three sharps, the notes to be altered from the original pitch are A, E, and B, to be raised comma; and F, C, and G, to be raised limma major. So that the note D, which is the second of the given key, would alone remain in its original pitch. This second being a discord to its proper key-note, whilst the key-note itself, with every other member of the key, have undergone an alteration of their pitch by the distance of a discordant interval; the idea of all concordant relation

relation to the principal key must be destroyed, the transition must be disagreeable, and the connection totally lost. Hence it seems to follow, that every such change of key must be unnatural, however the affectation of novelty may have induced some composers to introduce such transitions into their compositions: nay, in changing from the key major C natural to the key major D with two sharps, the given key-note, the third of the given key, the fourth and sixth of it, having all undergone alterations; the above opinion, that such a change must be unnatural and disagreeable, seems to be supported. The transition frequently made from one of the adjuncts of the principal key directly to the other, will appear to be no exception to this rule. For the slightest reflection will make it evident, that it is alone owing to the intimate connection and dependence of these adjuncts upon the principal key that such a change can be tolerated, and not at all to the relation which these keys independently hold to each other; for it is well known, that while
either

either of these adjuncts is introduced, and continues as such, the idea of its dependence upon the principal key is perfectly preserved.

This view of the subject seems to lead to a satisfactory decision upon the merit of questions which have arisen concerning the propriety of many passages in composition, introduced by some composers, and condemned by others as unnatural: and it will lead to distinct views of the most delicate connections, not only of the adjuncts and substitute of any particular key, but also of the subordinate adjuncts and substitutes, and of the conduct of their particular harmonies.

As the changes of key in flat harmony will be found to be under the same predicament with those already noticed respecting sharp harmony, reason seems to support the assertion of those who, upon the testimony of their senses alone, tho' imperfectly supplied with information from false performance, have condemned transitions to distant keys of both kinds: and

and (still confining our notions to the already discovered principles of tune) it seems reasonable to conclude, that, to the perfect expression of any chaste composition, no other degrees of tune are required than those comprehended within the limits of three signatures, containing three major and three minor keys. The ancients knew these, and no more; and the best modern writers seem to acknowledge no more.

All the others which our present system affords plainly appear to proceed from the false division of the scale into twelve indefinite half-notes. Indefinite they may well be called, since these twelve degrees of tune are all the furniture of a system of no less than twenty-four keys of music; whereas it can now be shown, that, to complete this system of six keys only, not less than eighteen degrees are required.

To show the impropriety of any change of key which would require a system of tune extended to more than the degrees contained in three contiguous signatures,

tures, in still another point of view: Let the key major C natural be the principal key given; if from it the modulation is carried into the key major D with two sharps, the leading chord to this key D consists of these notes, G, A', *C, E'. Every note of this chord but G is altered from the original pitch: and G, being a discord, seems to lose too much of its character as a member of the principal key in this situation to afford a sufficient support to the connection of tune; but especially when it comes to be resolved into the chord of D, the fundamental of which is itself a discord to the principal key-note, and both its harmonics, *F and A', are altered notes.

Nay, in the leading chord D, *F, A', C, which is the chord that ushers in the adjunct fifth of the given principal key, the principal key-note C itself stands amongst the harmonics of D as a discord; and the other two harmonics, *F and A', are both removed from their original pitch of tune. In this chord, therefore, the connection
of

of tune with the principal key seems to rest upon a most precarious footing *; the note C, as principal key-note, being as it were jostled out of its character by every note of the chord, and the idea of that character but feebly retained by the presence of C itself, obscured, and almost overwhelmed by the tendency of the other pitches of tune. Its situation here resembles that of a sick person in extremity, where, the soul being in a hovering state, as if doubtful about its departure, the smallest circumstance added to either scale is sufficient to cast the balance between life and death. In this case, the only remedy seems to be the resolution of the discord in the chord of fifth of the principal key, which consists of notes all in the original pitch, G, B, D; while any thing of a different tendency would dissolve the connection with the tune of the principal key. The chord of D with its seventh, containing no degrees of tune

S

but

* The balance hangs very even; C and D remaining in the original pitch, ♯F and A' altered.

but those natural to the key of G with one sharp, ought not to be considered as belonging to the key major with two sharps, but only as the leading chord of the fundamental fifth of the key G, introducing that key as adjunct to the principal key.

The reader will readily perceive, that the same law must take place in modulations into the minor keys belonging to this system: but the further application of this doctrine shall be left for his own amusement.

All this reasoning, however just it may appear from the received opinions concerning the properties of tune, and however useful it may be for discovering a practical limitation, must yet be left under the correction of future inquiry. All here meant is to show, that the true expression of what has been hitherto aimed at in composition, may be attained from a much less expensive apparatus than might be supposed.

Thus, it would appear, that any
note

note being given as a principal key-note, whether in the major or minor mode, a composer may from it, with all propriety, modulate into five different new keys, and no more; which keys are comprehended in the signature to which the principal key belongs, and the signatures which immediately precede and succeed it; and that the limits of modulation can be extended no further, without becoming (in the words of the ingenious Mr Malcolm) “unnatural and inconsistent.”

From the views hitherto taken, it would appear that these limits need not be extended; because within them lies all the variety that the diatonick scale can afford. For the same reason, too, it would seem, that all true tuneful composition may be executed upon an organ constructed with three signatures only, through all its modulations. For, by transposition, any piece of music, wherever its principal key is placed, may be removed to any other key of the same mode; and if its modulations or changes

of keys extend no further than these limits, an organ, whose tune comprehends no more than the degrees proper to three connected signatures, must be fit for executing all such composition in true tune.

By comparing the degrees marked in the Scale N° 76. called *Arrangement of three contiguous signatures*, with the degrees of tune in the Scales of particular arrangement N° 47, 48, 49, 50, 61, 62, it will be found, that, to constitute the tune of one signature in perfect diatonick intervals, eleven different degrees are required; the seven ordinary notes of the key major, the grave second and flat seventh, and the sharp sixth and seventh of the key minor. And in forming the next signature in order, there is required an addition of four degrees. If to these there be still added what is needful to complete the tune of a third signature, also in order, there will be only three additional degrees wanted besides those which have been already prepared for the other two. And every new signature required to be afterwards

terwards added to the tune of the instrument, will demand three new degrees. So that an instrument furnished with three full signatures in perfect tune will require no more than eighteen different degrees of tune to each octave; or, including the key-note repeated in octave, the number of notes required will be in all nineteen: and these will be fit to afford a modulation through six different keys, all in perfect tune.

This seems to point out the way to obtain the instrument in true tune in its most simple form; and also gives latitude for extending it indefinitely: for twenty-one degrees of tune will give eight keys, twenty-four, ten keys, and so on; adding three degrees for each additional signature, each signature comprehending a major and a minor key, till the instrument become as comprehensive as may be required.

Two staves only of music-lines are allotted to the Scale N^o 76.; because there are not more than two degrees of tune belonging to any finger-key; and conse-

quently no more than two transverse rows of pipes are required for these different degrees upon the organ. The degrees which are single, and the graver ones of the double degrees, are placed in one continued row upon the lowest staff; and the more acute degrees which remain, upon the upper staff; to shew the manner of placing the tune upon the instrument.

Upon examining this last scale, it will be found, that every place of the hemitonick scale of the common organ is supplied at least with one degree of tune, and some with two; the places which have two degrees being equal in number to those which have but one. Hence it might be hoped, that this system will give an additional proof of its authenticity, since it supplies the chroma completely in every degree, and even affords variety for choice.

Neither in this are our hopes altogether disappointed; for, upon examination, it will be found, that the degrees in this
simple

simple system afford materials sufficient to furnish the most approved chromatic passages with a fundamental bass and its accompaniments, all in just harmony to each other. But if these passages are restricted to the degrees marked in the Scale N° 76, and the fundamental notes of the harmony alone used for the bass, it must be acknowledged, that there is a necessity for admitting some quantities among the successive intervals of the fundamental progression, which have not hitherto been examined or defined: and although they seem well entitled to a place among tuneful intervals, yet they must be rejected at present, as inconsistent with the proposed plan of inquiry: therefore some new degrees are inserted as necessary to furnish out the chromatick passages in full tune, according to the received doctrines.

These new degrees are added to the Scale N° 76. upon a staff of music-lines put below. How far these additional degrees, or others which may be required for similar occasions, may be

found strictly necessary to furnish out the system, shall be left as matter of speculation to the curious. An appeal may be safely made to the judgment of the ear, attending to an instrument accurately tuned. But they are strictly necessary to the present purpose; which is to show, that there is no natural impossibility of pursuing tune in any direction, by intervals which have already been universally acknowledged to be just. Some of the approved chromatick passages are therefore added, (see N^o 77.), regulated by intervals acknowledged to be just, and yielding to the diverging properties of tune where it cannot otherwise be effected. The examination of these is left to such as are versant in the principles of musical composition and thorough-bass; to whom, a little attention to what has been said will render it easy: but without a formal discussion of that subject, it is impossible to make it at all intelligible to others.

The

The diverging properties of tune have been already explained: and it has been shown, that it is in the power of the composer to yield to, or to check the divergency, at pleasure; or to restore the original pitch, after it has been permitted to diverge to any distance, and in any direction. But in order to this, he must be perfectly acquainted with the nature of the diverging properties; and composers being hitherto in the dark about that matter, no wonder if our musical compositions shall often be found, upon examination, to run to extravagant distances from the original pitch.

From the small experience I have had in examining composition, it would seem, that the tendency of particular passages to diverge arises chiefly from an improper distribution of the harmonics among the parts; and that it may generally be checked by altering the situation of particular notes from one of the parts to another. But if it shall be required that an instrument be furnished with degrees to
supply

supply the diverging series, it is easy to add them; and, from what has been already said, the manner of tuning these degrees must be sufficiently obvious.

There are many observations of much curiosity which might be made from attending to the circumstances of this system of tune; but most of them cannot be rendered intelligible without transgressing the bounds of the present plan. One, however, may be mentioned. In regulating composition by this simple system, frequent opportunities occur of admitting some very small intervals into the progress of melodies, even down to the comma; all accompanied by regular fundamental progressions, with harmonies in full tune. Hence we are led to pay no small respect to the accounts delivered by the ancients of their *enharmonic* system of music.

Before concluding, it is incumbent on the author to mention an ingenious objection that has been started against the use

use of the reformed instrument in concert with others less perfect; it being said, that this would occasion a contrast, and produce still greater discordance among the parts.

In order to give the plainest answer to this objection, it is necessary, in the first place, to observe, that the degree of merit of every performer depends upon the degree of approach he is able to make towards true tune. Every tolerable performer, upon almost every instrument, has more or less command over the pitch of almost every note of his instrument; and having his ear attracted by what is excellent, he is irresistibly drawn to approach it. Hence every band of musicians is always known to be improved by the accession of a better performer. But vocal performers, and performers upon all instruments of the violin kind, can make this approach without limitation. Therefore it would seem reasonable to think, that the effect of the reformed instrument must be the improvement of the whole. For
although

although it is plain, that an untuneful instrument may greatly mar the effect of others more tuneful; the contrary position, that a tuneful instrument would be of disadvantage to others less perfect, is by no means evident.

But, to illustrate this point more clearly: Let the succession of tune, in every part of a fine composition, be represented by a beautifully waving line, (not that a straight one is improper), such as has of late been termed the *line of beauty* by Hogarth. The reader will remember, that it has been shown, that the errors of musicians fall sometimes on the side of acuteness, and sometimes on that of gravity: so that these errors, and the series of tune which contains them, may be justly represented by crooked lines of deformity; deviating from the tuneful line. Therefore, whilst one set of performers in concert are on one side of the tuneful line, and the rest on the other, besides the faults of each considered separately, these frequent oppositions must double the errors. But if the
tuneful

tuneful line be interposed between them, besides its constant effect to attract the others towards itself, it is at no time so distant from either of the sides as they are often from each other.

It is not foreign to the present point to observe further, that persons possessed of the finest natural ear for music, when first entering a full concert, instead of relishing it, rather find themselves embarrassed with what to them appears a confusion of different sounds, which they are incapable of uniting so as to perceive the combined effect. And perhaps it is not till after great experience that any one attains a tolerably complete idea of the joint effect of a full concert. In the meanwhile, it is universally admitted, that what is naturally beautiful never fails of producing an agreeable effect, when presented to the mind unbiassed by prejudice ; and, on the other hand, it is well known, that by the repeated use of things naturally displeasing, a relish for them may be acquired by habit. Shall it then be supposed,

fed, that the delight we feel from harmony arises not from what is naturally beautiful, but from what is naturally displeasing? Such a supposition seems too absurd to be admitted.

To what, then, may this embarrassment, upon first entering a full concert, be ascribed? Unquestionably to the imperfect agreement of the parts; owing to the defects of instruments, and the erroneous practice of performers. This, however, is not so considerable, but that, by time and experience, the mind being led to the idea of what ought to be produced, learns in some measure to supply the defects, by an effort of the imagination; whereas, if these errors had not existed, the beauties of harmony could not have failed to strike most powerfully, upon the very first hearing.

That this must be the case, seems clear from the experiments upon the tune of the fiddle, mentioned in the First Part of this Essay; especially if made with a wire. See page 133.

Judging

Judging when an approach is made within much less than half of comma to perfect concord, let the effect be noticed, and then make the chord as perfect as possible, the transcendancy of the perfect interval will appear so striking, as not to leave a doubt that the beauties of harmony could remain concealed from the most inexperienced ear, if produced in such a degree of purity. From what has been already shown concerning the tune of our best instruments, and the practice of the greatest masters, there is reason to apprehend, that we never, in any single instance, hear a full combination of musical sounds in concert that is not tainted with much greater blemishes. Nay, if the chords are finely adjusted, and drawn from a good fiddle, especially the chords of third and sixth, and more particularly the minor third and sixth, a person who has been much accustomed to the harpsichord will readily acknowledge, that his instrument, when in the best tune, never afforded distinct expression

pression of these chords, although that instrument is a standard one in all our musical performances.

It seems clear, that all our capital instruments are very susceptible of reformation, with little encroachment upon the simplicity of their present construction; nay, that all the varieties of tune required from each finger-key of the organ, in its most extensive form, may be commodiously produced from one single pipe placed to each finger-key. And it is not to be doubted, but that ingenious men may be excited by proper encouragement, in some future period, to exert their abilities for reforming the present, or contriving new instruments, agreeable to natural and true tune, now that it is presumed an opening has been made towards the knowledge of its laws.

But it is very questionable, whether the ears of the present generation will ever be gratified with the effect. The world, not unwisely, jealous of pretences to discovery, examines with caution, and slowly yields assent.

assent. It is therefore very uncertain whether it would be prudent for any one now living to risk his labour with a view to reap the reward. The apprehension of this must naturally damp the ardor of the ingenious; especially if they reflect on the late decision upon literary property, set up against the exertions of ingenuity in general.

From a review of the general subject of this work, reflections of moment might be added, were they not foreign to its design. The danger of precipitate judgment might be remarked. Many things have appeared, to philosophers, contradictory in science and in nature. Criticisms of various severity have been made. The wisdom even of Providence, in its wider administrations of the world, from circumstances apparently unaccountable, has been arraigned or altogether denied. There is no subject more fit to exemplify the rashness of such philosophy than the present; because there is no subject which has been considered, by men of the greatest talents

T

in

in all ages, to betray such inconsistency, as the laws of tune. No demonstrations have been held more conclusive than those which prove, that utter and complicated impossibilities forbid the reconciliation of the principles of music: And yet, after the spring has been fortunately touched, how spontaneously do they unfold themselves! how simply and rationally beautiful!

F I N I S.



PRINTED BY

MACFARQUHAR AND ELLIOT,

EDINBURGH.

1781.

CORRECTIONS.

Page 47. last line, for *the* read *a*.

— 55. l. 15. after *major* dele *or*.

— 76. l. 15. add the grave mark to ✕C at the end of the line.

— 104. l. 9. for 37 read 32.

— 107. l. 4. add the acute mark to E.

— 109. l. 8. after *first* add *string*.

— 139. l. 14. dele the comma after *perfectly*.

— 157. l. 22. of the table of affinities, after 4th dele *lesser*.

— 174. l. 16. add a sharp mark to F.

— 177. l. 11. add a grave mark to bC.

— 187. l. 17. for ✕G' read ✕G'.

— 194. col. 5th of the table, opposite to the finger-key ✕F or G, for $\frac{2048}{3025}$ read $\frac{2048}{2025}$.

— ibid. col. 4. l. 9. from bottom, for 3 2 1 read 2 2 1.

— ibid. col. 2. l. 7. from bot. add the acute mark to ✕A.

— 197. l. 9. for ✕F° read ✕F°.

— 199. l. 13. dele *may*.

— 208. l. 13. put a comma after *interval*.

— 211. l. 17. for *judge* read *resource*.

— 223. l. 4. dele *from*.

— 226. l. 4. after *of* add *affording it in*.

— 229. l. 16. dele &c.

— 231. l. 6. for *ingenious* read *ingenuous*.

— 234. l. 2. dele *more*.

— 245. l. 9. for *must* read *may*.

— 250. l. 8. dele *besides*.

DIRECTIONS to the BOOKBINDER.

The first *Eight* PLATES to be inserted between p. 152 and p. 153, and the remainder to be placed at the end of the book. They must not be stitched with guards, but sewed together over the backs, and made to fold out to the right.

CONTENTS

Page 1.	Introductory Remarks
Page 2.	Of the Nature and Extent of the Inquiry
Page 3.	Of the Principles of the Inquiry
Page 4.	Of the Methods of the Inquiry
Page 5.	Of the Results of the Inquiry
Page 6.	Of the Conclusions of the Inquiry
Page 7.	Of the Application of the Inquiry
Page 8.	Of the Importance of the Inquiry
Page 9.	Of the Necessity of the Inquiry
Page 10.	Of the Feasibility of the Inquiry
Page 11.	Of the Utility of the Inquiry
Page 12.	Of the Consistency of the Inquiry
Page 13.	Of the Harmony of the Inquiry
Page 14.	Of the Agreement of the Inquiry
Page 15.	Of the Concordance of the Inquiry
Page 16.	Of the Consensus of the Inquiry
Page 17.	Of the Consistency of the Inquiry
Page 18.	Of the Harmony of the Inquiry
Page 19.	Of the Agreement of the Inquiry
Page 20.	Of the Concordance of the Inquiry
Page 21.	Of the Consensus of the Inquiry
Page 22.	Of the Consistency of the Inquiry
Page 23.	Of the Harmony of the Inquiry
Page 24.	Of the Agreement of the Inquiry
Page 25.	Of the Concordance of the Inquiry
Page 26.	Of the Consensus of the Inquiry
Page 27.	Of the Consistency of the Inquiry
Page 28.	Of the Harmony of the Inquiry
Page 29.	Of the Agreement of the Inquiry
Page 30.	Of the Concordance of the Inquiry
Page 31.	Of the Consensus of the Inquiry
Page 32.	Of the Consistency of the Inquiry
Page 33.	Of the Harmony of the Inquiry
Page 34.	Of the Agreement of the Inquiry
Page 35.	Of the Concordance of the Inquiry
Page 36.	Of the Consensus of the Inquiry
Page 37.	Of the Consistency of the Inquiry
Page 38.	Of the Harmony of the Inquiry
Page 39.	Of the Agreement of the Inquiry
Page 40.	Of the Concordance of the Inquiry
Page 41.	Of the Consensus of the Inquiry
Page 42.	Of the Consistency of the Inquiry
Page 43.	Of the Harmony of the Inquiry
Page 44.	Of the Agreement of the Inquiry
Page 45.	Of the Concordance of the Inquiry
Page 46.	Of the Consensus of the Inquiry
Page 47.	Of the Consistency of the Inquiry
Page 48.	Of the Harmony of the Inquiry
Page 49.	Of the Agreement of the Inquiry
Page 50.	Of the Concordance of the Inquiry
Page 51.	Of the Consensus of the Inquiry
Page 52.	Of the Consistency of the Inquiry
Page 53.	Of the Harmony of the Inquiry
Page 54.	Of the Agreement of the Inquiry
Page 55.	Of the Concordance of the Inquiry
Page 56.	Of the Consensus of the Inquiry
Page 57.	Of the Consistency of the Inquiry
Page 58.	Of the Harmony of the Inquiry
Page 59.	Of the Agreement of the Inquiry
Page 60.	Of the Concordance of the Inquiry
Page 61.	Of the Consensus of the Inquiry
Page 62.	Of the Consistency of the Inquiry
Page 63.	Of the Harmony of the Inquiry
Page 64.	Of the Agreement of the Inquiry
Page 65.	Of the Concordance of the Inquiry
Page 66.	Of the Consensus of the Inquiry
Page 67.	Of the Consistency of the Inquiry
Page 68.	Of the Harmony of the Inquiry
Page 69.	Of the Agreement of the Inquiry
Page 70.	Of the Concordance of the Inquiry
Page 71.	Of the Consensus of the Inquiry
Page 72.	Of the Consistency of the Inquiry
Page 73.	Of the Harmony of the Inquiry
Page 74.	Of the Agreement of the Inquiry
Page 75.	Of the Concordance of the Inquiry
Page 76.	Of the Consensus of the Inquiry
Page 77.	Of the Consistency of the Inquiry
Page 78.	Of the Harmony of the Inquiry
Page 79.	Of the Agreement of the Inquiry
Page 80.	Of the Concordance of the Inquiry
Page 81.	Of the Consensus of the Inquiry
Page 82.	Of the Consistency of the Inquiry
Page 83.	Of the Harmony of the Inquiry
Page 84.	Of the Agreement of the Inquiry
Page 85.	Of the Concordance of the Inquiry
Page 86.	Of the Consensus of the Inquiry
Page 87.	Of the Consistency of the Inquiry
Page 88.	Of the Harmony of the Inquiry
Page 89.	Of the Agreement of the Inquiry
Page 90.	Of the Concordance of the Inquiry
Page 91.	Of the Consensus of the Inquiry
Page 92.	Of the Consistency of the Inquiry
Page 93.	Of the Harmony of the Inquiry
Page 94.	Of the Agreement of the Inquiry
Page 95.	Of the Concordance of the Inquiry
Page 96.	Of the Consensus of the Inquiry
Page 97.	Of the Consistency of the Inquiry
Page 98.	Of the Harmony of the Inquiry
Page 99.	Of the Agreement of the Inquiry
Page 100.	Of the Concordance of the Inquiry

DIRECTIONS TO THE BOOKBINDER

The first Eight Pages to be inserted between p. 1 and p. 2, and the remainder to be placed at the end of the book. They must not be mixed with the rest of the text, but must be kept separate and bound in the right place.

Organ

Handwritten musical notation on a five-line staff, featuring various notes and accidentals. The notation is organized into three measures, each with a key signature change indicated by a sharp sign (#).

Measure 1: 8^{ve} gr., 4th, 5th, 6th gr., 2^d 1st 2^d 3^d 4th 5th 6th 7th 8^{ve} gr.

Measure 2: 3^d 1st 2^d 3^d 4th 5th 6th 7th 8^{ve} gr.

Measure 3: 2^d 1st 2^d 3^d 4th 5th 6th 7th 8^{ve} gr.



Three
D.
C.
T. G. B.

For

Attachment of the book

to the library









Maxwell, Francis Kelly,

An essay upon tune Being an attempt to free the scale of music, and the
tune of instruments, from imperfection ; Illustr. with pl

Edinburgh u.a. 1781

Mus.th. 2243

urn:nbn:de:bvb:12-bsb10599056-8